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VERTICAL MARKET ANALYSIS

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Client/Server Applications Trends—Insurance

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Introduction

This is the fourth in a series of reports analyzing trends in client/server (C/S) applications by vertical industry. These reports are produced as part of INPUT's *Client/Server Markets and Applications* subscription service. Each report focuses on a single industry. Additional reports compare industries in their approach to C/S.

A Objectives

This report addresses the following issues with regard to the insurance industry sector:

- To what degree is the industry as a whole migrating to client/server architectures?
- Which applications are likely to be targeted for implementation over the next two years, and which are headed for a downsized client/server environment?
- Who is managing various aspects of the implementation or conversion of these applications? The central information systems function (IS), end-user management, its local IS function, or third parties?
- To what degree are industry participants looking to outside vendors for products and services?

B**Scope**

The scope of this analysis is limited to the insurance industry sector within the United States. Specifically, INPUT defines this sector as including those industries containing the two-digit SIC (Standard Industrial Classification) codes shown in Exhibit I-1.

EXHIBIT I-1**Insurance Industry Sector Definitions**

Code	Description
63xx	Insurance carriers
64xx	Insurance agents, brokers and services

This particular study focused on carriers, with 95% of the respondents coming from firms in the 63XX category, broken down as follows:

- 6311 - Life insurance
- 6321 - Accident and health insurance
- 6324 - Hospital and medical service plans
- 6331 - Fire, marine and casualty insurance
- 6351 - Surety insurance
- 6399 - Insurance carriers not otherwise classified

C**Methodology**

Data for this analysis were taken from INPUT's applications data base. This data base is built from a continuous telephone interview program to gather information about companies' applications plans. The field interviewing process was initiated in January 1993. Over 1,600 interviews have been completed to date.

In some instances more than one interview was conducted per institution. This was particularly true for extremely large firms such as Prudential and Metropolitan Life, where interviews were conducted with multiple operating units. The number of companies in the insurance sample was 80. The total number of interviews was 115.

These 115 interviews were the primary source of data for this report. They provided information on 169 different applications that will be implemented in the next two years.

Respondents identified the applications or projects they would be implementing over the next two years using their own terminology, rather than being required to categorize applications by some predetermined set of definitions. Once the survey was completed, INPUT analyzed the 169 project descriptions and coded them into 39 application types. The 39 types were then further grouped into 8 application categories for purposes of this analysis. Exhibit I-2 describes the applications by category.

Detailed descriptions of each application type are contained in Appendix A.

EXHIBIT I-2

Definition of Insurance Application Categories

Application Category	Application Type
Financial	Financial Reporting General Ledger Accounts Payable/Receivable Billing Fixed Assets Budgeting Cost Accounting
General Infrastructure	Imaging Systems Data Base Conversion - Relational/Dist. Platform Migration - C/S Data Conversion Data Base Conversion - General Platform Migration - General OS - Upgrades/Conversions
Human Resources	Payroll Benefits Administration Human Resource Info. Systems
Insurance Operations	Claims Loss History & Payment Policy Processing Customer Records Reinsurance Administration Agency Automation Actuarial Support Agency Interface Commission

EXHIBIT I-2 (CONTINUED)

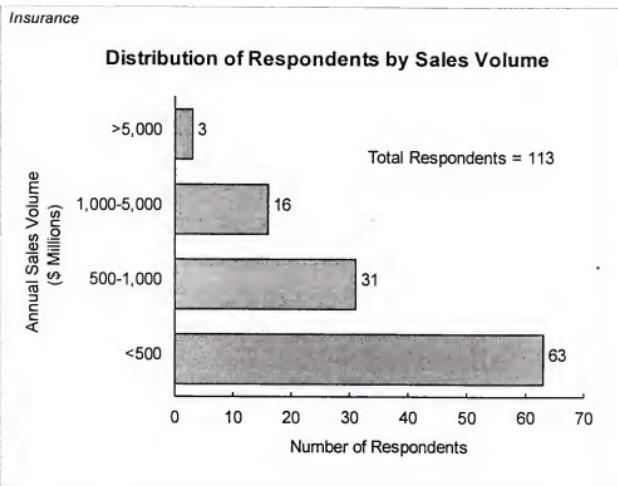
Definition of Insurance Application Categories

Application Category	Application Type
Other Cross-Industry	Customer Service Purchasing EDI Systems
Office Systems	Word Processing
Planning and Analysis	Executive Information Systems Spreadsheets/Data Bases Financial Modeling
Sales and Marketing	Marketing Management & Support Order Entry Tracking Sales Analysis Sales Forecasting Telemarketing

Additional information was drawn from secondary research sources and INPUT's existing library of current information on insurance to round out the analysis.

D**Characteristics of the Sample****1. Sample Demographics**

In general, the sample represents a cross-section of insurance institutions, including property and casualty, life and health insurance firms. The breakdown of respondents on the basis of annual company or divisional sales volume is given in Exhibit I-3.

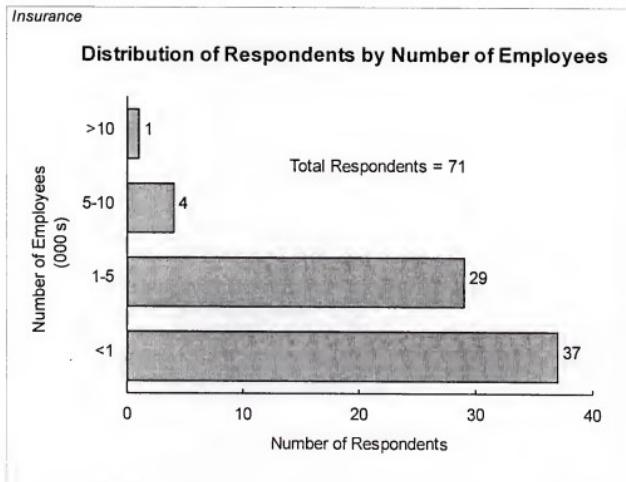
EXHIBIT I-3

The average annual sales volume for the sample was approximately \$750 million.

Throughout this report the companies were grouped into three size categories for purposes of analysis. The following definitions apply:

- Large - Greater than \$1 billion
- Medium - Between \$500 million and \$1 billion
- Small - Under \$500 million

The average number of employees was approximately 1,500, and the population was distributed as shown in Exhibit I-4.

EXHIBIT I-4

2. Characteristics of Survey Respondents

Although the surveys are targeted at user managers with direct responsibility for line or staff operations, respondents sometimes referred interviewers to the information systems (IS) function for responses to all or parts of the survey. Consequently, respondents included members of the corporate IS function or divisional IS management as well as non-IS line or staff management. Exhibit I-5 gives the distribution of respondents by job class. The following definitions apply:

- **Line Manager** - A manager/executive responsible for line operations at a corporate or divisional level; e.g., vice president of operations, vice president of sales, director of product distribution, etc.
- **Staff Manager** - A manager/executive in charge of staff operations at a corporate or divisional level; e.g., vice president of human resources, chief financial officer, or director of purchasing.

- **IS Manager** - A manager/executive whose primary responsibility is the management of information systems activities at a corporate or divisional level.

EXHIBIT I-5

Job Classification of Respondents Insurance

Job Classification	Proportion of Respondents (%)
Line Manager	10
Staff Manager	42
IS Manager	48

This distribution is comparable to the mix encountered in both the discrete and process manufacturing surveys. However, the total proportion of user respondents (52%) is considerably less than the 78% in the banking and finance industry sector study.

In some instances line managers were unable to deal with questions regarding platforms, but were very clear regarding their applications requirements and plans. IS executives filled in the gap with more information on platforms, overall spending, and discussion of the general direction of the IS function.

E

Organization

The remainder of the report is organized into three chapters:

- Chapter II, *Executive Overview*, provides a summary of the findings of this study.

- Chapter III, *Insurance Applications Trends*, discusses the key applications that will undergo conversion or re-implementation by insurance firms over the next three years. It addresses such issues as:
 - Target platforms and platform combinations
 - Near-term investment levels in applications development
 - Project management and control strategy
 - Analysis of the applications by application category
- Chapter IV, *Client/Server Directions in Insurance*, analyzes the data at a more detailed level with particular emphasis on the role that client/server will play in insurance applications over the next two years.

II

Executive Overview

Prospects for the future of the U.S. insurance industry are guardedly optimistic. The weak economy and highly unusual underwriting losses experienced over the past several years have combined to place many insurance companies in jeopardy of failure, and others are rethinking their overall business strategy. But it appears that the industry's response to negative conditions coupled with a gradual economic recovery will bring a turnaround over the next several years.

Each segment has its own problems. But as a general indication of the industry's recent health, it's sufficient to say that last year the number of life and health insurers that fell into major financial difficulty increased by 38%. Over capacity in some sectors, coupled with competition from other industries such as banking and finance, have generated significant pressure to reduce costs and threaten the viability of certain aspects of the business.

A brief review of the key subsectors of the insurance industry provides a meaningful setting from which to assess likely future systems directions.

- *Property and Casualty* - 1992 was the worst year in history for natural disasters in the U.S., and 1993 is not turning out to be much better. Payments from property and casualty companies topped \$23 billion dollars in 1992 alone. A lot of insurers went bankrupt and others elected to retreat from either classes of risk underwriting, high risk geographic areas, or both. The impacts of the unusually large numbers of natural disasters and growing fraud have caused insurers in this sector to totally rethink their strategies, and in many instances focus on niche markets.

- *Life Insurance* - Life insurance companies rely heavily on long-term investments to fund future liabilities. During the 1980s, life insurance companies made significant changes in their investment strategy by moving large portions of their funds into real estate and high yield securities. Unfortunately, the major downturn in the economy has had a dramatic negative effect on these types of investments leaving many insurers holding delinquent real estate loans and devalued junk bonds. Although the economy shows signs of some turnaround, it will be some time before the life insurance sector recovers from these investment decisions.

In addition to problems on the investment side, the industry is facing increasing competition from banks and other financial institutions that offer alternative investment products to compete with traditional whole-life policies.

One bright spot has been annuities which are expected to grow at 8%-12% over the next several years. Annuities are rapidly becoming a popular investment with many individuals who see them as a retirement hedge against decreasing job security and questionable corporate pension plans.

- *Health Insurance* - During the 1970s and 1980s, the profits of health insurance companies rose along with health care costs. However, by the late 1980s the disproportionate rise in health care costs compared to the overall growth of the economy had stimulated a national crisis in the health care industry, leading to the rapid rise of health maintenance organizations (HMOs) and primary provider organizations (PPOs). The rapid growth in the number and size of these organizations has eroded profits in the traditional health insurance business.

At this point, some national approach to health care seems inevitable. As a consequence, health insurers who traditionally have opposed national health care plans have shifted sides, and are lobbying for the role they might play in a national program.

Insurers are responding to the current challenges through restructuring, focusing on their core businesses, and placing increasing emphasis on service as a differentiating factor. Consolidations through mergers and acquisitions are becoming commonplace as the industry attempts to deal with the issue of over capacity.

These strategies have significant ramifications in terms of the deployment of systems technology in all segments of the industry. Although IS has not been exempt from the cutbacks brought on by the poor financial performance of the industry, it is seen as a key weapon in implementing new strategies.

- The re-engineering of business processes to speed up transaction turnaround and reduce costs is causing change to the industry's core systems.
- The decentralization of decision-making processes requires that more information be made available to agents and other industry operatives.
- The emphasis on service requires that service representatives have ready access to customer information and the ability to manipulate it.
- Targeting markets and creating differentiated offerings is placing additional emphasis on the availability of company internal as well as external information sources for purposes of analysis.

The overall impact is causing the controlled decentralization of information and stimulating the use of client/server technology.

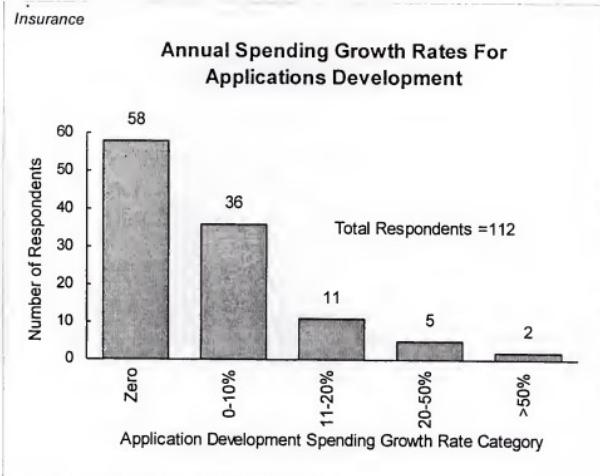
To gain a more in-depth understanding of how the systems environment is changing in the industry, INPUT analyzed data from 80 financial institutions on 169 applications that are scheduled for implementation, modification or conversion over the next two to three years. Respondents to the survey consisted of user managers, divisional or user IS executives, and managers and executives from corporate IS functions.

A**Expenditure Plans and Key Issues****1. Expenditure Plans**

Spending rates for both applications improvements and IS overall appear to be improving, compared to the 4% to 5% rates prevalent in 1991. On average, the respondents to this survey planned to increase their spending over the next two years as follows:

- Total IS spending will grow at an annual rate of 7% per year.
- Applications development spending will grow at a rate of 6.6% per year.

Exhibit II-1 shows the distribution of annual spending growth rates for applications improvements by growth rate category.

EXHIBIT II-1

Units that reported growth rates for applications expenditures in excess of 10% contributed 25 applications out of the 169. Based on a more detailed examination of this group of applications, INPUT concludes:

- The highest growth in spending will occur in the smaller companies. Fifteen of the 25 applications in the above 10% growth rate group come from firms reporting under \$500 million in sales.
- The areas targeted for maximum growth in spending are dominated by financial and core business applications, with 20 of the 25 applications coming from these two categories. Key applications appear to be policy management, on-line health care systems, claims processing, and on-line management information systems.

High growth rates are not concentrated in any given part of the industry. Life, property and casualty, and health carriers are all reporting growth rates in the 6% to 7% range.

2. Key Issues

The survey identified responsiveness as the leading issue facing the industry's systems environment. The ability to react quickly to rapidly changing business requirements is a major issue. Re-engineering internal business processes using new technology will be key to dealing with this issue and meeting two more of the industry's key objectives:

- Cost reduction
- Improved customer service

Respondents cited systems integration as the second most critical issue. In order to decentralize and streamline business processes, insurers expressed a strong need to place access to more types of information in the hands of employees to facilitate decentralized decision making.

The ability to address these issues in the short term is inhibited by two roadblocks that cannot be easily overcome.

- A portfolio of legacy systems designed to support individual lines of business
- A shortage of capital to invest in major systems efforts

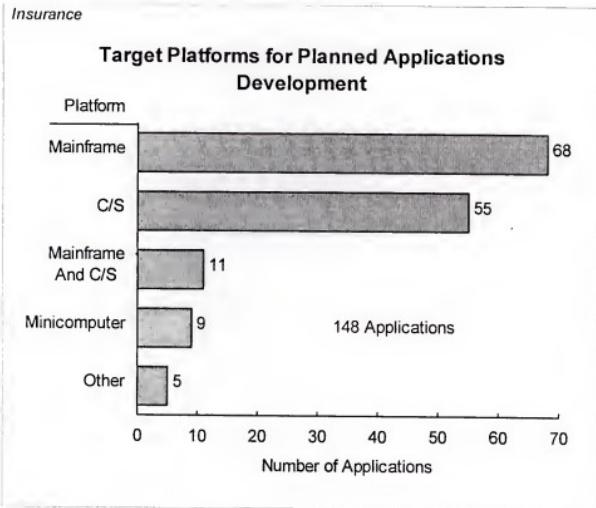
B

Applications Trends in Insurance

1. The Movement to Client/Server

Exhibit II-2 shows the target platforms for the 148 applications in the sample for which platform information was available.

EXHIBIT II-2



Overall, 50% of the identified applications will use workstation/PC-C/S architectures as some component of the target platform. Furthermore, unlike the banking and finance sector, many of the applications for which C/S is the primary architecture will be core business applications; 40% for insurance versus 23% for banking and finance. The movement to C/S is likely to accelerate as more money becomes available to invest in re-engineered systems.

- C/S architecture provides good facilities for dealing with the moderate volume of complex transactions that are typical of the industry's core applications.

- The capabilities that can be designed into new systems on the client side offer significant opportunities to improve customer service, a key strategy in all sectors of the industry for obtaining differentiation.

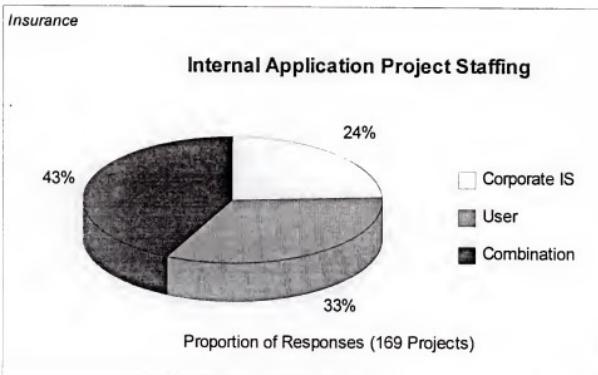
2. Project Management and Implementation Strategy

The direction is clearly toward the user in terms of project management of applications development.

- Thirty-seven percent (37%) of the respondents' projects will be managed by user line or staff executives. This is approximately double the rate in the manufacturing industry sectors, and just under the 40% identified in an analysis of the banking and finance industry. Another 18% will be managed by IS organizations reporting directly to user management.
- Corporate IS will manage 37% of the projects.
- The remaining 16 applications will use a team approach to implementation or use systems integrators.

In addition to heavy involvement in project management, users will carry a significant portion of the implementation responsibility, as shown in Exhibit II-3.

EXHIBIT II-3



The proportion of systems that will be totally implemented without resources from corporate IS (33%) is significantly higher than the 20% for banking and finance. However, this is not an indication that a wholesale distribution of systems authority is an industry trend.

As is the case in the other financial sectors, centralized IS has played a dominant organizational role in the industry since the 1960s. Through corporate IS, the industry has made heavy investments in examining and exploiting new technologies, developing project management and implementation methodologies, and maintaining an expert technical staff. Nevertheless, insurance executives recognize the importance of information systems in achieving operational success. The heavy integration of these systems into daily operations, coupled with redesign of fundamental business processes, points to significant organizational impacts from new systems implementations. Thus, the heavy emphasis on direct user participation in all aspects of the process.

Examination of the survey results shows that approximately 70% of the new applications that involve insurance operations will be implemented by line organizations, either directly or through unit or divisional IS organizations. All but two of the infrastructure and in-house systems integration efforts will be implemented by IS. This division of implementation responsibility is likely to continue and accelerate over the next few years.

C

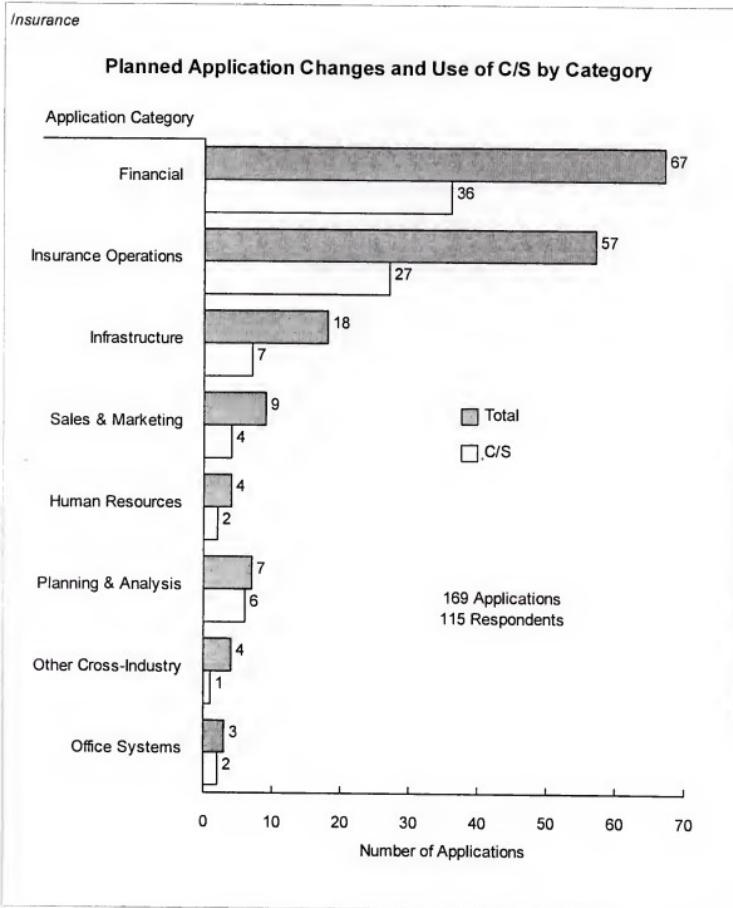
Key Client/Server Applications in Insurance

It appears that C/S architecture will achieve high penetration rates in the insurance industry over the next few years.

1. Client/Server Penetration by Application Category

Though not as pervasive in insurance as in the manufacturing sectors, C/S architecture is targeted for 50% of the 169 applications, as shown in Exhibit II-4.

EXHIBIT II-4



The top two categories, financial and insurance operations, contain most of the industry's key operational systems. Applications in these two categories will use C/S approaches in just over 50% of the implementations. The fact that these two categories make up 73% of the sample indicates a strong industry commitment to C/S technology.

There is little variation in the use of C/S by industry subsector. Life, property and casualty, and health insurers are all forecasting a 50% penetration rate for C/S technology.

However, it appears that large companies across all industry subsectors are taking a more conservative approach. Only 26% of applications reported by firms in the "large" category are targeted for C/S environments. This lower rate is partly attributable to a difference in overall systems strategy. Many of the large companies are leaving core processing systems in place and bridging data into smaller C/S environments for applications such as customer support, claims tracking, and analysis systems. Medium-sized and small companies tend to be dealing with more fundamental changes in their business strategies through a total re-engineering of core applications.

Regardless of these small differences, it seems apparent that the insurance industry will be one of the leaders in the use of C/S technology, and is likely to move more aggressively than indicated in this analysis once current business performance improves.

2. Leading Targets for C/S Implementation

Excluding office systems and planning and analysis applications, traditional strongholds for the use of C/S, the application categories with the highest C/S implementation rates are financial systems (54%), human resources (50%), and insurance operations (50%).

Specific applications that rank high on the list include:

- Claims loss history and payments
- Financial reporting
- Policy processing
- Agency automation
- Customer records

D**Conclusions**

- The insurance industry is a prime candidate for continued penetration of C/S technology. Not only is the technology well-matched to the industry's core applications requirements, but industry pressure to reduce costs and re-engineer existing systems will continue to open the door for new and innovative uses.
- The rate of adoption and types of applications that will be re-engineered to use C/S will vary somewhat depending on the size of the company. Small companies are likely to be considering a total re-engineering approach. This means that C/S will be adopted for core applications more quickly than for large companies.

Large companies will take a more evolutionary approach; utilizing existing systems to "feed" data to updated C/S-based customer service, claims processing and analysis systems.

- All subsectors of the industry appear to be looking to C/S technology as a key component of their systems environments.
- Spending levels on applications development and maintenance appear to be solid, particularly in light of the industry's financial performance over the past several years. Changes in regulatory requirements will stimulate additional spending beyond that identified in this study. This is particularly true in the health care and property and casualty segments of the business.
- Applications development responsibility is moving directly to users; maintenance of standards, major infrastructure projects, and IS leadership continues to be provided by corporate IS.

Client/server technology already has a strong foothold in the industry. The primary limitation to accelerated adoption of the architecture for new and re-engineered applications is the poor financial performance of many companies.

A combination of an economic upswing with a more favorable underwriting/risk ratio than the industry has experienced in recent years is likely to push investment in systems to even higher levels over the next several years. When this happens, C/S will take an even stronger role as a key technology.

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III

Insurance Applications Trends

This chapter presents a detailed analysis of the applications data base. The chapter is organized as follows:

- Section A analyzes the general trends identified in the survey.
- Section B presents the breakdown of applications by class, target platform and the types of resources that will be used to manage and accomplish the implementation.

A

General Trends in Insurance IS

The survey examined a number of key trends with regard to the evolution of old and the development of new applications over the next two years. It included examinations of:

- Anticipated changes in hardware and software platforms
- Expected levels of total IS and applications spending
- Anticipated changes in the IS organization
- Major IS issues

1. Anticipated Changes in the Systems Environment

Respondents provided information on specific changes in their systems environment over the next two years. Responses fell into three categories.

- **Upgrades** - Seventy-nine percent (79%) of the respondents anticipate that migrating systems environments or moving toward C/S will be the predominant strategy for application migration over the next several years. Upgrading existing applications was reported as the major strategy by only 21% of the respondents.

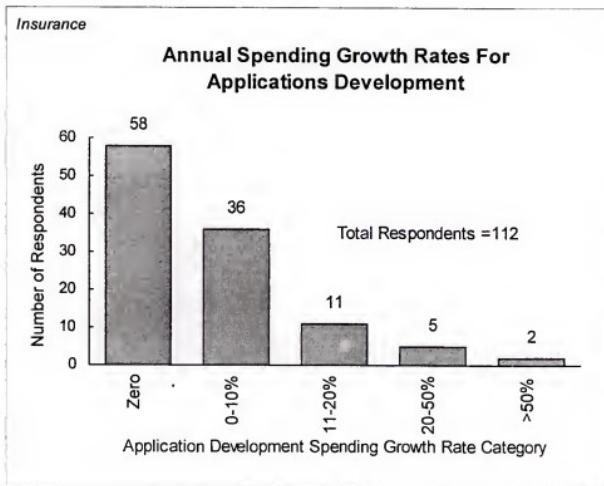
When the sample is analyzed on the basis of institution size, it becomes evident that the large companies (above \$1 billion in sales) are planning fewer major changes. In fact, 31% anticipate that upgrading existing systems will be the major migration route for their firms over the next two to three years. Only 20% of the institutions under \$1 billion considered the upgrading of existing systems a key strategy.

- **Increased/Decreased Standardization** - Movement toward increasing standardization in platforms and operating environments was predicted by 13% of the respondents, and only three respondents anticipated any decrease in standards.
- **Migration to C/S** - A significant proportion of insurance companies are adopting C/S migration strategies. Of the total survey population, 39% indicated that migration to C/S would be a primary strategy for upgrading the existing systems environment. This is approximately one-and-one-half times the proportion of firms in the banking and finance sector. Furthermore, unlike the banking and finance sector, large companies are heavily involved in adopting C/S, with 56% of the companies surveyed with sales volumes above \$1 billion indicating a commitment to C/S as a general architectural approach.

2. Expectation Levels for IS Spending and Application Improvements

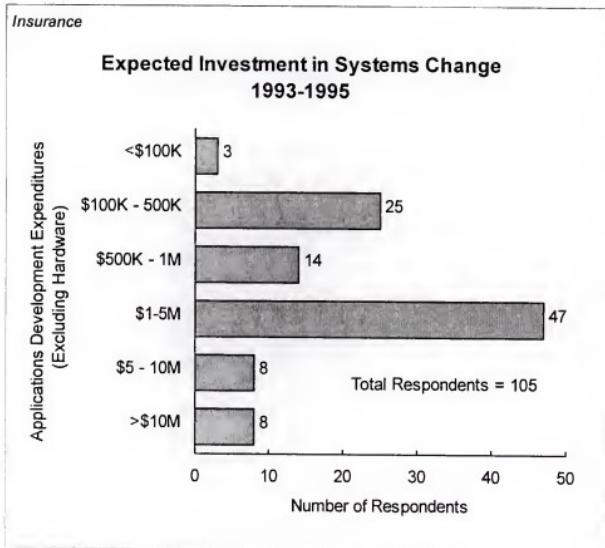
Respondents anticipate growth in spending for information services to be approximately 7% per year for the next two years. Growth in spending for applications development is anticipated to be just under the 7% rate for the same period.

Exhibit III-1 shows the distribution of annual spending growth rates for applications development by growth rate category.

EXHIBIT III-1

These numbers are comparable to those in the manufacturing sector, but are considerably less than the 10% to 12% rates forecasted for the banking and finance sector. Nevertheless, the growth rates are substantial, given the significant problems the insurance industry has had with cash generation over the past several years.

Exhibit III-2 shows the distribution of expenditure levels for applications change in the next two years.

EXHIBIT III-2

Considering that respondents were speaking about systems investments for their individual departments or operating units (not about total company investment in IS), it is significant that over 60% of the respondents expect to be spending more than \$1 million in improvements over the next two years.

Further analysis of the group of departments and divisions that anticipate expenditures of \$1 million and above over the next two years indicates:

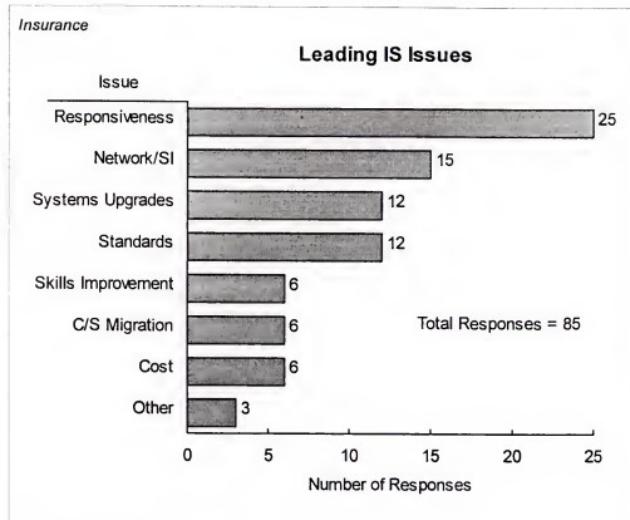
- There is little correlation between the size of the company and the size of the expenditures.
- There is little variation between life, property and casualty and health insurance companies.

Analysis of the data did not identify leading indicators of high spending levels.

3. Major Information Systems Issues

As shown in Exhibit III-3, the most frequently mentioned IS issue was the need to make IS more responsive.

EXHIBIT III-3



A brief explanation of each category follows.

- **Responsiveness** - The ability of the systems environment to respond to changing application needs and user management information requirements
- **Network/Systems Integration** - Network integration itself or the integration of applications across a distributed network
- **Systems Upgrades** - The need to upgrade existing systems to handle new requirements or increased capacity
- **Standardization** - Improved connectivity, the portability of applications across multiple platforms and the adoption of common standards for workstation/PC and network interfaces
- **Skills Improvement** - "Re-tooling" in-house staff to deal with changing skill requirements brought on by new technology
- **C/S Migration** - Planning for, implementing or downsizing to C/S technology
- **Cost** - Downsizing or distribution of existing staff or general budget reductions involving systems expenditures
- **Other** - Miscellaneous other responses

In general, responses focused more on the applications and business aspects of systems rather than technology.

- The responsiveness category was clearly the leader in terms of user issues. Examination of the individual responses reflected concerns over the need to enhance or re-engineer systems in a manner that would improve flexibility and reduce operating costs.
- The dominant theme for the 30% of the issues cited in the network/systems integration and upgrade category was the need to integrate applications for purposes of providing better overall management or customer-related information.
- The client/server and standards issues make up the bulk of the remainder.

This focus on responsiveness rather than technology probably reflects the following:

- The sample contained just over 50% user executives whose perspectives are generally on applications and current needs rather than technology. These executives cited responsiveness as the leading issue in 60% of their responses, compared to IS executives, whose response rate was 15% on the same issue.
- Managers in the insurance sector have deployed technology as an integrated part of their business strategy for many years; as a result, they have a more balanced perspective as to its potential and limitations than do executives in some other sectors.

B

Insurance Applications Trends

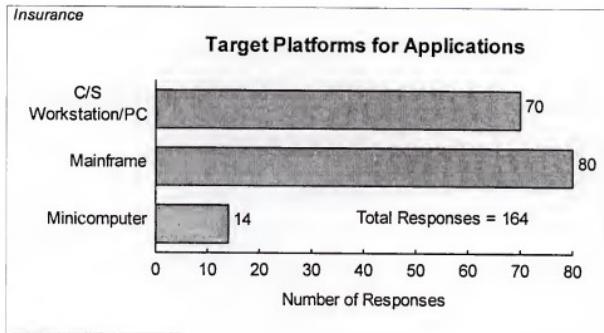
For each application identified as critical in the next two years, respondents were asked to provide information on:

- Target platforms
- Project leadership strategy
- Project staffing
- The use of software packages
- EDI utilization
- Outsourcing
- C/S and/or downsizing strategy

1. Target Platforms

Approximately 47% of the applications developed over the next two to three years will employ a workstation/PC-based platform component, as shown in Exhibit III-4.

EXHIBIT III-4



A cross-tabulation of this data by company size indicates that approximately 26% of the applications will utilize C/S-workstation/PC architectures in the large firms, compared to 44% for companies in the small and medium-sized categories. This difference reflects not only the more conservative C/S migration path being followed by large insurers, but also their reluctance to totally re-engineer existing core systems.

Analyzing the same data as a function of class of insurer show that life insurance companies will be making heavier use of workstation/PC technology, than all other groups. Forty-five percent (45%) are targeted to use the technology, compared to an approximate 35% for the remaining categories of insurers.

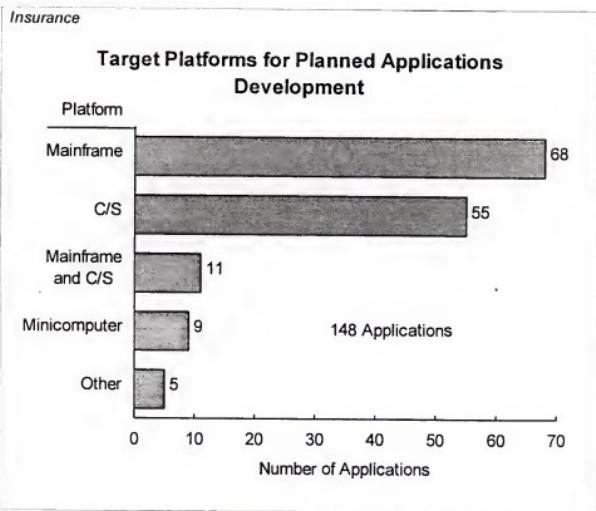
This difference reflects the capability of the technology to deal with at least two structural changes in the life insurance area.

- The need to tailor individual policies to specific customer requirements
- Decentralization of policy writing and approval authority to reduce internal bureaucracy and improve customer response

This is a different requirement than for other sectors of the financial services industry, where products are more standardized.

The data shown in Exhibit III-5 indicate that in insurance, the applications being developed over the next two to three years will most probably be targeted for workstation/PC-based C/S or mainframe architectures. This is significantly different from the manufacturing industry sectors, where many more combinations of platforms involving minicomputers will be used.

EXHIBIT III-5



This distribution of platform combinations is similar to that of the banking and finance sector. The one significant difference is that the approximately 40% of the C/S applications being developed in insurance will be core business applications, compared to only 23% for banking and finance, reflecting:

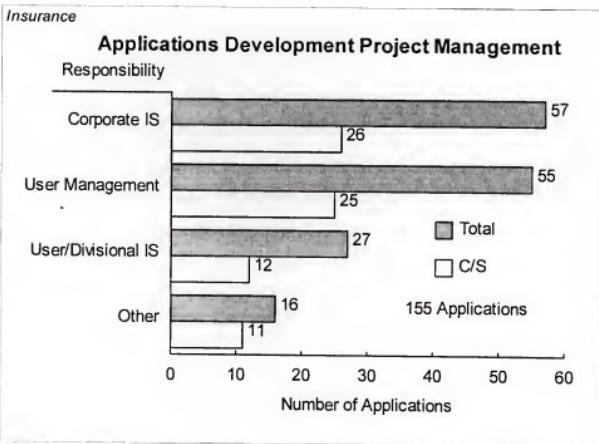
- The ability of current C/S technology to deal with the lower transaction volumes encountered in insurance as compared to banking and finance

- The superior capabilities of C/S technology to deal with text, a key element in supporting the insurance industry with custom-tailored products

2. Project Leadership Strategy

User management is playing an increasingly important role in project management for applications development in the insurance sector, as demonstrated by Exhibit III-6.

EXHIBIT III-6



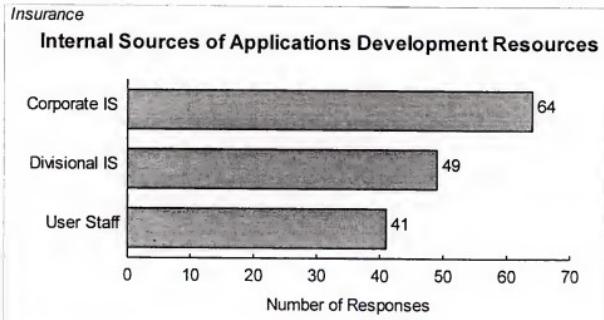
Over 35% of the projects will be implemented with user line or staff management assuming direct project management responsibility. This is close to double the average number for the manufacturing industry sectors. Including the 27 projects that will be managed by user or divisional IS functions, the total that will be managed outside of the corporate IS function jumps to 53%. Nevertheless, corporate IS will continue to play a role in applications development in the insurance sector, managing 37% of all applications development.

Size of institution is not a differentiating factor for project management strategy. User management continues to have a key role in systems management, whether the company is large or small.

3. Sources of Development Resources

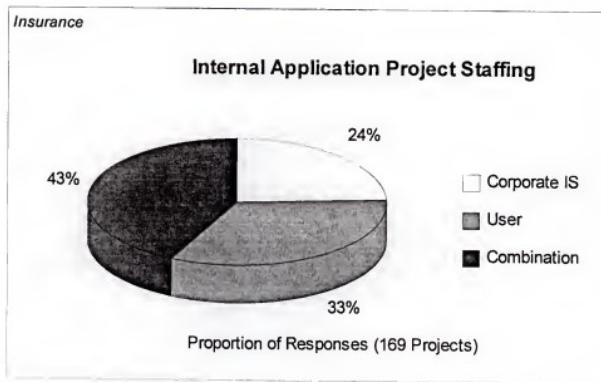
When it comes to the actual development process, corporate IS is still the leading provider of resources, as shown in Exhibit III-7.

EXHIBIT III-7



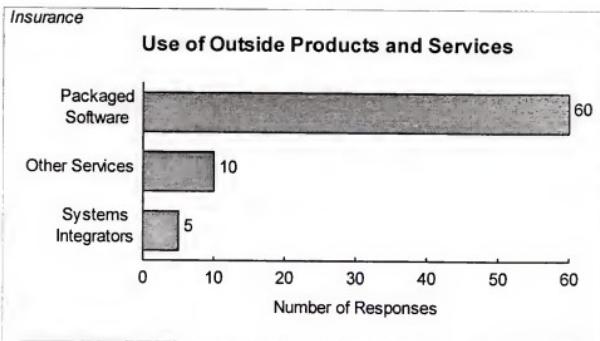
As shown in Exhibit III-8, in addition to managing a significant portion of development projects, users will implement 33% of the projects without the involvement of corporate IS. This is a higher proportion by 13% than observed in the other portions of the financial services industry, and is comparable to the statistics for the manufacturing sectors.

EXHIBIT III-8

**4. Use of Software Products and External Resources**

As shown in Exhibit III-9, over 35% of the implementations planned for the next two years will make use of licensed or purchased software packages.

EXHIBIT III-9



There are only minor variations in the use of third-party software by class of insurer or size of company.

- Middle-sized firms are the largest users of packaged software. The majority of applications using purchased or licensed software will be administrative and staff applications for which off-the-shelf packages are probably more adaptable than for large firms.
- Accident and health insurance firms are least inclined to use third-party packages.

The use of systems integrators and other outside professional services was surprisingly low, given the size of the sample.

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IV

Client/Server Directions in Insurance

The preceding chapter addressed trends with regard to insurance applications development. This chapter discusses the types of applications that will be implemented over the next two years, and the role that client/server architecture will play in the implementations. The chapter is organized as follows:

- Section A provides an analysis of the role that client/server is playing for each of the major classifications of applications.
- Section B analyzes the impact of institution size and spending levels on the use of C/S technology.
- Section C identifies the leading client/server applications for the insurance industry group.

A

Client/Server Applications Analysis

1. Sample Summary

Exhibit IV-1 shows responses to key survey questions by application category.

EXHIBIT IV-1

Insurance
Implementation Plans by Application Category

Application Category	Number of Applications	Strategy		Platform		Resources					Utilizing EDI	Outsourced	
		Client/Server	Downsizing	Workstation/IPC	Minicomputer	Mainframe	Corporate IS	Divisional IS	User Staff	Systems Integrators	Other Outside Svcs.		
Financial	67	36	23	28	5	28	21	20	16	0	3	27	23 12
Insurance Operations	57	27	12	21	7	31	23	17	10	2	5	16	32 7
Infrastructure	18	7	1	7	1	9	7	3	6	0	1	4	11 4
Sales & Marketing	9	4	2	3	1	4	4	3	5	2	1	4	7 1
Planning & Analysis	7	6	4	6	0	2	4	3	1	1	0	5	2 0
Human Resources	4	2	1	2	0	3	3	1	2	0	0	0	3 1
Other Cross-Industry	4	1	0	1	0	3	2	2	1	0	0	1	1 0
Office Systems	3	2	0	2	0	0	0	0	0	0	0	3	1 0
	169	85	43	70	14	80	64	49	41	5	10	60	80 25

An explanation of the column headings follows:

- "Number of Applications" is the total number of applications for each of the application categories.
- The "Strategy" heading contains two subheadings, "Client/Server" and "Downsizing." The "Client/Server" count by category indicates the number of applications within the category that will be implemented using a C/S architecture. The count under the heading "Downsizing" represents the number of client/server applications out of the total that are being implemented as part of a general downsizing strategy.

- The "Platform" heading indicates the number of times that one of the three major platform classes was mentioned as the key implementation platform.
- The "Resources" heading covers six sources of potential resources that will be employed as part of the implementation process. As was the case with the question regarding platform, more than one response per application was permitted.
- Finally, for each application, respondents were asked to indicate whether the application would utilize EDI or be outsourced. The last two columns give a tabulation of those responses.

2. Observations on the Sample Mix

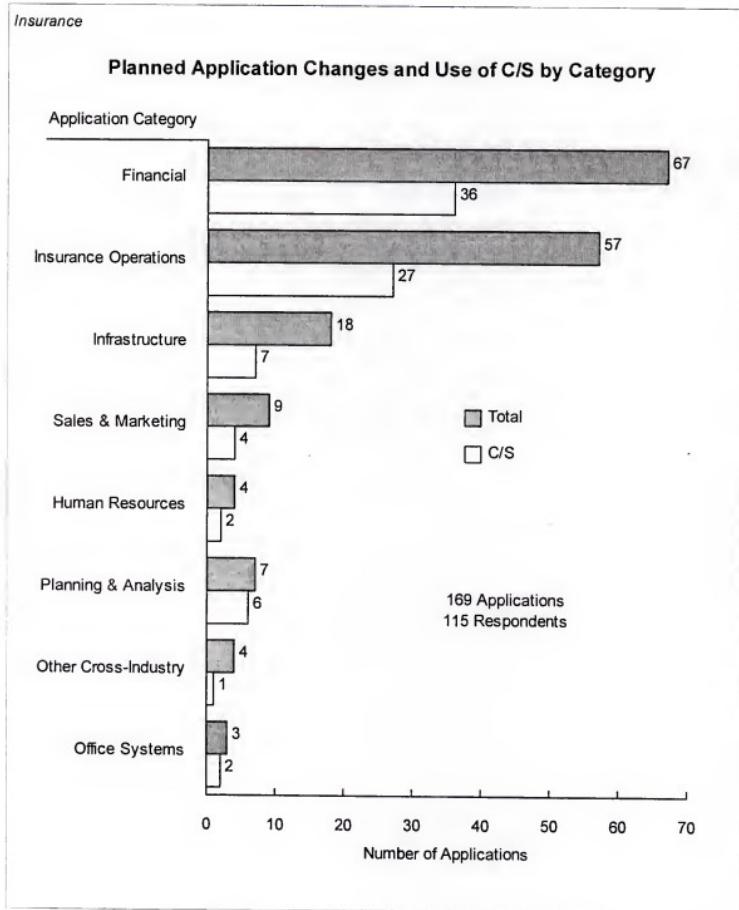
The sample contains a balanced mix of applications, with a third coming from the insurance operations category. As is the case in the banking and finance sectors, there appears to be a very heavy emphasis on financial applications. This is due to the following:

- Changes in federal and state regulatory reporting requirements are outstripping the capabilities of existing financial systems.
- Re-engineering of financial systems offers opportunities for the downsizing of staff activities.
- A number of applications managed by corporate finance, and considered staff support in other industry sectors, are considered operational systems in insurance. These include asset and portfolio management and other treasury activities. Depending on the particular institution, these might show up as separate departments in the sample or be included in corporate finance. In this sample, of the 67 applications reported in the finance category, 29 or 43% are properly categorized as part of insurance operations.

3. Client/Server Applications by Category

Exhibit IV-2 shows planned application changes by category compared to those that will use C/S architectures.

EXHIBIT IV-2

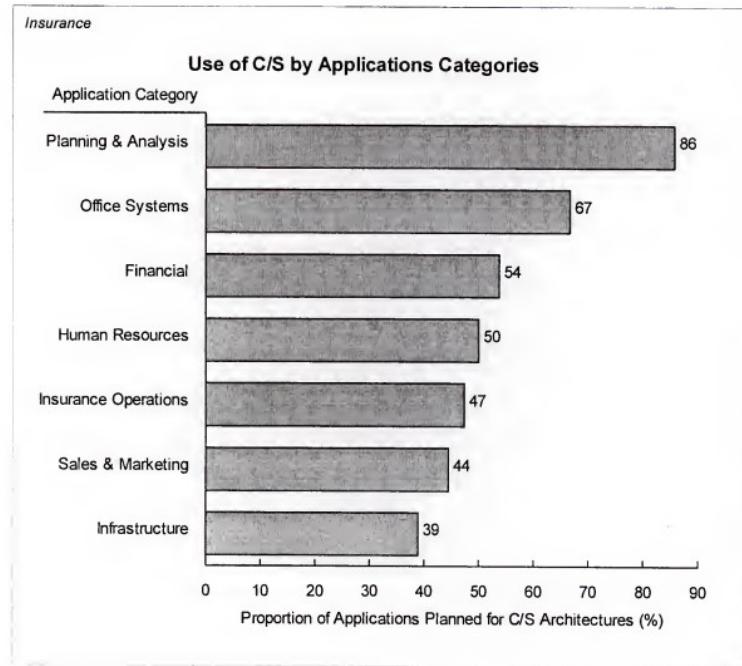


Fifty percent (50%) of the 169 implementations identified in the survey are targeted for some type of C/S architecture. Furthermore, the data points to a strong commitment to use C/S architecture for the industry's core applications. The top two categories, financial and insurance operations applications, contain most of the industry's key operational systems. They account for 73% of the sample and will use C/S technology in just over 50% of the implementations. This compares to a 38% C/S implementation rate for core applications in the banking and finance sector. This difference results from the following facts:

- Many of the core applications in the insurance sector require one or more human interactions to obtain closure on a given transaction. Examples include claims processing and policy processing, where judgments must be made based on company and third-party data sources as to what will be paid or what/who will be insured. Consequently, individual transactions may remain open for extended periods and involve the maintenance of complex history files. The C/S environment is ideally suited for applications with these requirements.
- Many applications involve direct interaction with customers. Using a C/S platform for these applications offers opportunities to design features into the systems that support improved customer service.
- C/S technology can generally handle the transaction volumes involved in insurance applications. This is not the case in many core banking and finance systems.

Exhibit IV-3 ranks the application categories by their proportionate use of C/S technology.

EXHIBIT IV-3



The office systems and planning and analysis categories are established strongholds for the utilization of C/S technology in all industry categories. Finance and insurance operations have been previously discussed.

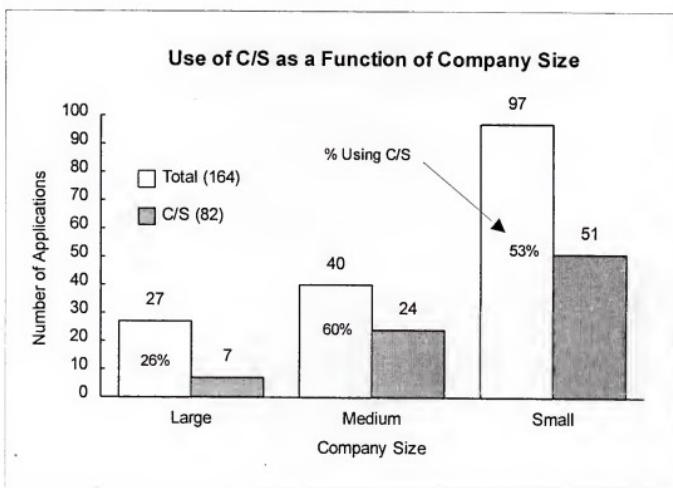
The one anomaly appears to be in the infrastructure category. One would expect that at least 50% of the infrastructure projects would be using C/S if that is the general industry direction. However, only 39% of these projects identified in the sample are currently planned for C/S implementations. This is probably due to the following:

- Since there were only 18 infrastructure projects identified in the sample, it is quite possible that the population is not representative of overall use of C/S in the industry's infrastructure projects.
- Four of these infrastructure projects were focused on imaging systems. None of them plan to use C/S. In the insurance industry these applications are typically large scale and related to centralized records management. These may be regarded as not amenable to C/S technology. No doubt the applications that will be built around these centralized image repositories will "serve" images to workstations for analysis and operational purposes.

B**Variation by Size and Type of Insurer**

Exhibit IV-4 shows how the total sample and use of C/S compare on the basis of size.

EXHIBIT IV-4



It appears that the large companies are taking a less aggressive approach to C/S technology than the other two groups. For institutions in this category, the proportion planning on C/S implementations is significantly less than the sample average of 50%. The primary reason for this difference is that most of these companies are taking a much more incremental approach to systems migration, leaving core systems in place, and adopting C/S technology only to deal with improved customer service at the operational interface.

There is almost no variation in the use of C/S based on an analysis of the sample by class of insurer. Life, casualty and health insurers all indicate a C/S utilization rate of approximately 50% for applications to be implemented over the next two years.

C**Use of C/S in Specific Applications**

Exhibit IV-5 shows the number of each type of application in the survey sample and the proportion of each targeted for the use of C/S platforms. Applications are grouped by application category. Appendix A gives specific definitions for each application type.

EXHIBIT IV-5**Detailed Distribution of Applications Planned and Use of C/S Insurance**

Application Category	Application Type	Number Apps.	Number C/S	Share C/S (%)
Financial	Financial Reporting	17	9	53
	General Ledger	17	9	53
	Accounts Payable/Receivable	10	4	40
	Billing	6	2	33
	Fixed Assets	4	3	75
	Budgeting	2	1	50
	Cost Accounting	2	1	50
	Tax Accounting	1	1	100
	Integrated Financial Systems	1	1	100
	Other	7	5	71
Total		67	36	54
Insurance Operations	Claims Loss History & Payment	17	5	29
	Policy Processing	16	7	44
	Customer Records	5	3	60
	Reinsurance Administration	3	1	33
	Agency Automation	2	2	100
	Actuarial Support	1	1	100
	Agency Interface	1	1	100
	Commission	1	1	100
	Other	11	6	55
Total		57	27	47
General Infrastructure	Imaging Systems	4	0	0
	DB Conversion - Rel./Dist.	2	1	50
	Platform Migration - C/S	2	2	100
	Data Conversion	1	0	0
	DB Conversion - General	1	1	100
	Platform Migration - General	1	0	0
	OS - Upgrades/Conversions	1	1	100
	Other	6	2	33
Total		18	7	39

EXHIBIT IV-5 (CONTINUED)

Detailed Distribution of Applications Planned and Use of C/S Insurance

Application Category	Application Type	Number Apps.	Number C/S	Share C/S (%)
Sales and Marketing	Marketing Mgt/Support	4	0	0
	Order Entry Tracking	1	1	100
	Sales Analysis	2	1	50
	Sales Forecasting	1	1	100
	Telemarketing	1	1	100
	Total	9	4	44
Planning & Analysis	Executive Information System	3	2	67
	Spreadsheets/Data Bases	3	3	100
	Financial Modeling	1	1	100
	Total	7	6	86
Human Resources	Payroll	2	0	0
	Benefits Administration	1	1	100
	Human Resources Info. Sys.	1	1	100
	Total	4	2	50
Other-Cross Industry	Customer Service	2	1	50
	Purchasing	1	0	0
	EDI Systems	1	0	0
Total		4	1	25
Office Systems	Word Processing	3	2	67
Total		3	2	67
Grand Total		169	85	50

Overall, the best opportunities for C/S in insurance beyond office systems and planning and analysis applications, appear to be in financial and industry-specific applications. Customer records, all aspects of agency systems, and policy processing are key targets for the area of insurance operations.

Exhibit IV-6 ranks the applications to be developed over the next two years by frequency of mention and shows the corresponding use of C/S.

EXHIBIT IV-6**Ranking of Planned Applications for C/S
Insurance**

Application Type	Number Appls.	Number C/S	Share C/S (%)
Claims Loss History & Payments	17	5	29
Financial Reporting	17	9	53
General Ledger	17	9	53
Policy Processing (P&C), (H&L)	16	7	44
Accounts Payable/Receivable	11	4	36
Other Insurance Operations	11	6	55
Other Financial Systems	7	5	71
Billing	6	2	33
Customer Records	5	3	60
Other Infrastructure	5	2	40
Fixed Assets	4	3	75

A

Definition of Application Types by Application Category

This appendix provides definitions of all the applications identified in this study. The applications are grouped according to categories. Exhibit A-1 includes all applications that are unique to INPUT's definition of the insurance industry sector. Exhibit A-2 contains definitions of applications identified in this study that INPUT defines as cross-industry.

 EXHIBIT A-1

Insurance Operations Application Types

Application Category/Type	Description/Examples
Insurance Operations	
• Agency Automation	Systems to automate operational and local office accounting for agencies
• Actuarial Support	Provides mathematical and statistical processing for purposes of rate setting
• Agency Interface	Systems providing connectivity between insurers and either captive or independent agents
• Claims Loss History and Payment	Systems providing the entry point for information regarding claims and the administration of payments
• Commission	Tracking and management of commissions for both captive and independent agents
• Customer Records	Insurance history and profile for customers
• Policy Processing	Systems to administer changes in policies, as well as the entry of new policy holders into the system
• Reinsurance Administration	Tracking of reinsurance contracts

EXHIBIT A-2

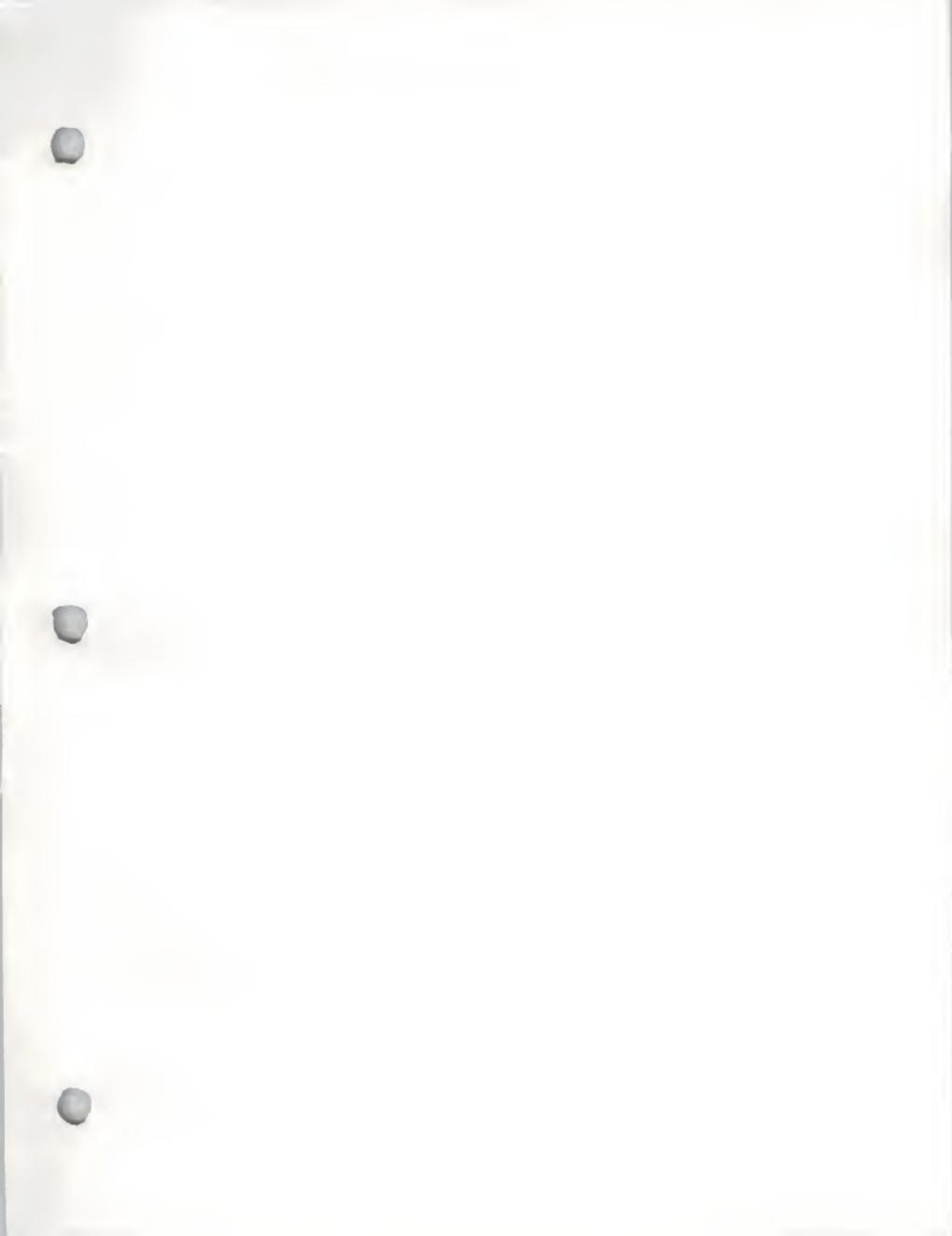
Cross-Industry Application Types by Category

Application Category/Type	Description/Examples
Financial	
• Accounts Payable/Receivable	Traditional systems to handle invoicing and payments and manage receivables
• Billing	Traditional invoicing with item detail
• Budgeting	Corporate or divisional applications to facilitate and track the budgeting process and budget management
• Cost Accounting	Systems to analyze the costs of goods and services
• Financial Reporting	Financial systems for the generation of management info.
• Fixed Assets	Systems to track the book value and depreciation of assets
• General Ledger	General ledger
Human Resources	
• Benefits Administration	Systems to manage complex or simple benefits plans
• Human Resource Info. Systems	Data base systems to provide information for human resource management
• Payroll	Payroll processing
General Infrastructure	
• Data Base Conversion - General	Migration to a new data base architecture
• Data Base Conversion - Relational/Distributed	Migration to a relational or distributed (or both) architecture
• Data Conversion	Projects to convert the date from one data base environment to another
• Hardware Upgrades	Projects to upgrade or migrate to new hardware
• Imaging Systems	Installation of infrastructure to support imaging applications
• Operating System Upgrades	Operating system upgrades
• Platform Migration - C/S	Projects to upgrade or migrate to new client/server hardware
• Platform Migration - General	Projects to upgrade or migrate to new general purpose hardware or networks
Office Systems	
• Word Processing Systems	Installation of applications that use word processing
Other Cross-Industry	
• Customer Services	Customer inquiry management, hotline, service and support
• EDI Systems	General-purpose systems to support EDI
• Purchasing	Purchase order processing, management, reporting
Planning and Analysis	
• Executive Information Systems	Systems that provide integrated management information directly to management
• Spreadsheets/Data Bases	Applications that utilize desktop spreadsheets and data bases
• Financial Modeling	Systems to support financial business modeling and analysis

EXHIBIT A-2 (CONTINUED)**Cross-Industry Application Types by Category**

Application Category/Type	Description/Examples
Sales and Marketing	
• Marketing Mgt./Support	Sales management, market planning, advertising, etc.
• Order Entry Tracking	Capture and tracking of orders and fulfillment
• Sales Analysis	Statistical analysis of sales performance and trends
• Sales Forecasting	Systems to support the projection of future orders
• Telemarketing	Applications to support telemarketing operations





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I

Introduction

This report analyzes trends in client/server (C/S) applications in the health services industry. It is the fifth in a series of vertical market reports produced as part of INPUT's Client/Server Markets and Applications subscription service.

A

Objectives

Based on a user survey, this report addresses the following issues with regard to the health services sector:

- To what degree is the industry migrating to client/server architectures?
- Which applications are likely to be targeted for implementation over the next two years, and which are headed for a downsized client/server environment?
- Who is managing implementation or conversion of client/server applications? The central information systems function (IS), user management, its local IS function, or third parties?
- To what degree are industry participants looking to outside vendors for products and services?

B

Scope

The analysis focuses on the health services industry sector within the United States. This particular study focused on applications in hospitals and individual practitioners' offices, with 73% of the respondents representing hospitals. Doctors' offices and clinics represented 21% of the sample. In some cases, hospital

management organizations were interviewed. The SIC (Standard Industrial Classification) codes listed in Exhibit I-1 define the market.

EXHIBIT I-1**Health Services Industry Respondents
By Industry Sector**

Code	Description	Number of Respondents	Percent of Respondents
801x- 804x	Offices and clinics of individual practitioners	27	21
805x	Nursing and personal care facilities	6	5
806x	Hospitals, general and specialty	91	73

C**Methodology**

Data for this analysis was taken from INPUT's applications database, and built from telephone interviews that took place throughout 1993. The number of different organizations interviewed in the health services sample was 106.

In some instances, more than one interview was conducted per institution. This was particularly true for extremely large hospital management groups, where interviews were conducted with multiple operating units. The primary source of data for this report came from 124 interviews.

Respondents identified 200 applications or projects they would be implementing over the next two years using their own terminology, rather than using a predetermined set of definitions. Once the survey was completed, INPUT analyzed the 200 project descriptions and coded them into 11 application types. Exhibit I-2 lists the applications identified in the survey by category. Detailed descriptions of each application type are contained in Appendix A.

The sample size is relatively small compared with the size of the market. Graphs and charts are provided to supplement intuition rather than as a statistically rigorous analysis of the market that would have required more interviews.

EXHIBIT I-2

Definition of Health Services Application Categories

Application Category	Application Type
Medical Applications	
Hospital Operations	Clinical Records, Executive Information and Decision Support for Medical Staff, Patient Admission-Discharge-Transfer, Patient Care and Diagnosis, Patient/Service Scheduling
Medical Departmental	Laboratory Systems, Medical Dictation, Medical Imaging, Medical Research Support, CAT Scanning & Radiology, Radiology Information, Pharmacy Systems
Medical Documentation	Medical Claims, Medical Forms Tracking
Medical Financial	Cost Containment and Tracking, Hospital Budgeting, Medical Billing
Cross-Industry Applications	
Accounting	Accounts Payable/Receivable, General Ledger
Electronic Commerce	EDI, Electronic Payments Systems
Human Resources	Payroll
Infrastructure	Hardware, Software & Network Upgrades
Office Systems	Electronic Mail & Messaging, Desktop Publishing, Word Processing
Planning and Analysis	Forecasting, Spreadsheets
Purchasing	Ordering, Supplies Management, Purchase Tracking
Sales & Marketing	Marketing Support
Other	Computer-Aided Training, Voicemail

In addition to the survey, interviews with three medical institutions were undertaken to provide information for the case studies in Chapter V. These assess the interest in C/S from the

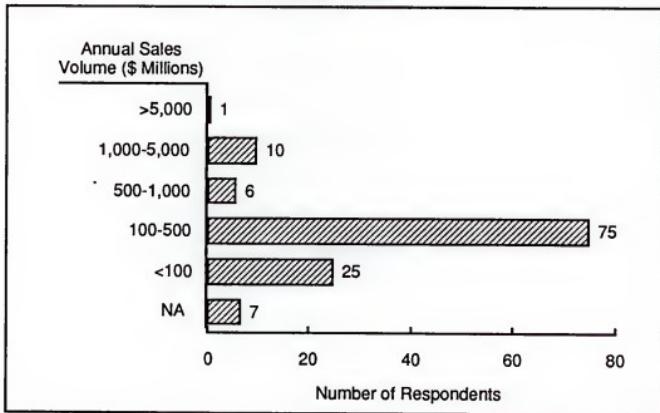
medical community. Additional information was drawn from vendors, secondary research sources and INPUT's existing library of current information on the health care industry.

D**Characteristics of the Sample****1. Sample Demographics**

The breakdown of respondents' organizations on the basis of annual company or divisional sales volume is given in Exhibit I-3.

EXHIBIT I-3

**Distribution of Respondents by Sales Volume
Health Services**



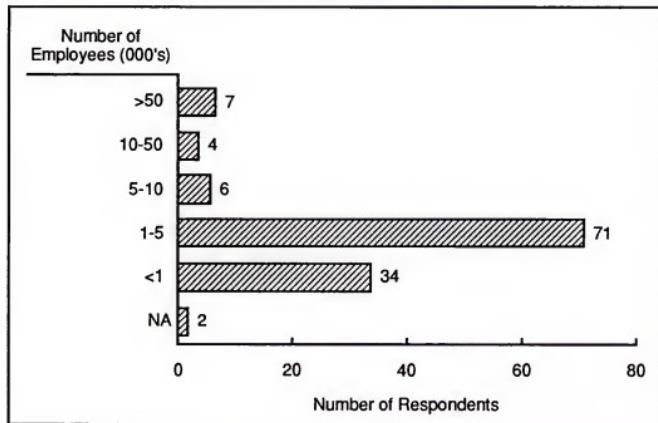
Total Respondents: 124

Institutions surveyed had an average annual sales volume of \$570 million. Sales volume statistics for hospitals, some of which rely on support from foundations and grants, are not always obtainable and seven of the respondents were unable to give sales data. In some cases, health management organizations responsible for a group of hospitals were interviewed.

Throughout this report the institutions were grouped into three size categories for purposes of analysis. The following definitions apply:

- Large - Greater than \$500 million
- Medium - Between \$100 and \$500 million
- Small - Under \$100 million

The average number of employees was approximately 5100, and the population was distributed as shown in Exhibit I-4.

EXHIBIT I-4**Distribution of Respondents by Number of Employees
Health Services**

Total Respondents: 124

2. Characteristics of Survey Respondents

The survey was targeted at user managers who had direct responsibility for line or staff operations in a functional area other than information systems (IS). Respondents sometimes referred interviewers to the IS organization. Consequently, respondents, whose distribution is shown in Exhibit I-5, include:

- Line Manager—A manager/executive responsible for line operations at a corporate or divisional level; e.g., vice president of operations, vice president of sales, director of product distribution, etc.
- Staff Manager—A manager/executive in charge of staff operations at a corporate or divisional level; e.g., vice president of human resources, chief financial officer or director of purchasing.
- IS Manager—A manager/executive whose primary responsibility is the management of information systems activities at a corporate or divisional level.

EXHIBIT I-5

Job Classification of Respondents—Health Services

Job Classification	Respondents (Percent)
Line Manager	19
Staff Manager	76
IS Manager	5

A high percentage of the respondents represented staff in finance, marketing, radiology and pharmacy support departments.

E

Organization

The remainder of the report is organized into five chapters:

- Chapter II, Executive Overview; summarizes the findings of this study and provides recommendations for both vendors and purchasers of C/S systems.

- Chapter III, Applications Analysis; discusses the key applications that will undergo conversion or reimplementation by health services firms over the next three years. It addresses:
 - Trends in health care applications
 - Leading issues
 - Analysis of the applications by application category
 - Where client/server systems are being installed
 - Target platforms and platform combinations
 - Anticipated changes in the system environment
- Chapter IV, Management and Budgets; analyzes who will manage the projects and the size of their budgets. It discusses:
 - Project management and control strategy
 - Outside resources
 - Near-term expenditures for applications development
 - Growth rates for budgets
- Chapter V, Health Services Application Case Studies; describes client/server implementations in representative industry applications.
- Chapter VI, Vendor Analysis; reviews respondents comments on leading vendors and identifies technology vendors that are supplying solutions for the health care market.

F

Related Reports

INPUT has published three other recent reports in the Health Services market that complement this report:

- *Health Services—Information Services Opportunities and Trends, 1993-1998*

- This report focuses on general industry statistics and trends. It describes medical applications in detail. It also covers some of the major software vendors, including HBO, Shared Medical Systems and IBAX.
- *Electronic Commerce in U.S. Health Care*
- *Systems Integration in Health Services*
- Vendor Analysis Program Company Profiles on many vendors that sell into the Health Services market including:
 - American Software Corporation
 - Cerner Corporation
 - CIS Technologies
 - CM Computers
 - CyCare Systems
 - ELCOMP Systems
 - Global Software
 - HBO and Company
 - Health Data Sciences Corporation
 - Health Management Systems
 - IBAX Health Care Systems
 - Integrated Health Systems
 - Medical Information Technology (MEDITECH)
 - MEDSTAT Systems
 - Physicians Practice Management
 - Quality Systems
 - Shared Medical Systems
 - TDS Health Care Systems (ALLCARE)
 - Terrano Corporation

II

Executive Overview

This chapter summarizes the key findings in the report.

- Section A describes the industry
- Section B discusses the key findings and answers the questions given at the start of the report.
- Section C provides key statistics
- Section D gives recommendations

A

Industry Background

Health care reform in the U.S. is driving government, vendors and users to adopt more cost-effective information management solutions. According to the New England Journal of Medicine (August 5, 1993), one in every four dollars spent on hospital care is for administration. Client/server computing promises to reduce the cost of medical administration long-term by:

- Integrating records from different care providers, thereby reducing duplication of information
- Providing doctors with more information, enabling them to prescribe appropriate treatment more quickly
- Reducing paper handling using electronic forms, imaging and database management systems

Traditionally, the health care information systems (HCIS) market has been highly fragmented with diverse computer systems. Doctors and hospital administrators often prefer to make capital investments in medical equipment, such as magnetic resonance imaging (MRI) scanners, rather than computer systems. For

example, a doctor can view a patient's medical history from a database server alongside a digitized image from a MRI scanner on a client workstation. Client/server architectures provide opportunities for hospitals to improve the quality of medical care by connecting medical equipment with information systems.

Networking advances have dramatically altered the dynamics of hospital information systems. Many of the hospitals INPUT interviewed have made a commitment to distributed systems. Community networks that link hospitals, doctors and insurance companies are emerging.

B

Key Findings**Client/Server Migration**

About 40% of new or upgraded systems in health care institutions are migrating toward a C/S architecture. This is above some industries—such as banking. The health care market is an active field as new vendors attempt to enter the market and existing vendors merge or are acquired.

An analysis of budgets shows that some very large projects with budgets in excess of \$10 million are planning to use a C/S architecture, but there are also many smaller projects in the \$100 to \$500 thousand range. Many of these are pilot projects.

The health care market is a fragmented systems market with many small mainframes and minicomputers. Hospitals are not throwing these away and expect to merge them into systems with more integrated user interfaces. This is a market where simple user interfaces will prevail.

Applications Opportunities

There are many opportunities for improving the level of care by integrating diagnostic information with patient records. This can be accomplished by using a PC or workstation to display data from different systems side-by-side. Both forms and medical images, such as X-rays, can be handled with image servers. Vendors entering the imaging market will need robust, low-cost solutions that can be readily integrated with existing computers.. The increasing acceptance of multimedia technologies in other

business segments should enable more widespread use of imaging systems in hospitals.

Another key area of activity is in communications. Electronic claims forms and EDI systems for purchasing hospital supplies are two areas where C/S systems are expected to be widely installed. There is much waste in medical treatment because patient records are dispersed throughout general practitioners', medical specialists' and hospital offices. There is an effort by some health organizations to provide central access to key records electronically to reduce the cost of paperwork. The foundation for such a system is a reliable communications infrastructure. Vendors that can integrate distributed applications and connect patient record systems have an opportunity for success.

One of the most rapidly growing areas for C/S systems is in administrative offices. As office professionals cut costs, they look to improve efficiency by connecting information systems. Administrators will use their office PCs to access mainframe hospital records systems. Also departmental LANs with small servers are being implemented for executive information and decision support.

Given that many medical practitioners have notoriously poor handwriting, voice annotation will be integrated into mainstream applications.

Downsizing

There is relatively little downsizing in the health care market, affecting only about 10% of the applications. Two of those applications are claims processing and accounting systems. Many hospitals are keeping their older systems and integrating them. Hence, rather than selling hospitals on downsizing, vendors need to emphasize integration of existing systems.

Outsourcing

Only four applications out of 200 were being both downsized and outsourced—two were medical billing systems and the other two were claims processing systems. Of the 10% of systems using outsourcing, payroll, accounting, claims processing and billing were the main applications.

Systems Management

Central IS departments are still key project managers in the health care market. User groups may provide requirements, but their role is not as strong as in other markets. Many of the central IS departments support mainframes.

Use of Outside Services

Traditional system integrators have not been as strong in the health services market, where established vendors of software and services provide custom systems. However, with more rapidly customizable systems, the value added by established vendors is diminishing and technology driven system integrators, who have good tools for rapidly building applications, are entering the market. Medical organizations are looking for software packages that are flexible, easy to use and rapidly integrate with existing systems. An example of a recent entrant into the market is PeopleSoft with its C/S development platforms for human resources and other applications.

C

Key Statistics

The survey covered 106 institutions (mainly hospitals), 124 interviews and 200 applications.

Approximately 40% of respondents indicated a major strategy toward C/S platforms. The highest interest in C/S was in office systems where more than 70% of new or upgraded systems are expected to be implemented using a C/S architecture. Other application categories of high C/S interest are electronic commerce (56%) penetration, accounting systems (54%) and medical billing (48%).

Of the 200 applications, more than 40% will use mainframes, 14% minicomputers and almost 30% LANs as a primary platform. More than 20% of applications expect to use EDI.

More than 60% of applications will be developed by central IS, almost 30% by divisional IS and approximately 40% by user management with some applications being implemented by mixed groups, IS and a few user representatives.

System integrators are only being considered for implementing 13% of applications, but 38% will be implemented using other outside services. These are traditional medical systems suppliers—a combination of value-added resellers and software developers.

D

Recommendations**For Vendors**

The health services market is ripe for C/S computing, but it is becoming difficult to penetrate because of increased competition. The ability to create applications rapidly means newer vendors are entering, what has traditionally been, an introspective market. Established software and system vendors to the health services market need to keep their technology current by reselling some of the newer products for C/S computing. New vendors can penetrate the market if they have reliable, easy-to-use solutions and are prepared to invest in learning about the market.

Vendors must not underestimate the involvement of central IS departments and need to include them in their solutions, particularly given the installed base of mainframes and minicomputers.

The least penetrated parts of the market for C/S networks are away from major metropolitan areas. A vendor who can partner with regional system integrators may have success in smaller towns.

For Medical Organizations

Ensure vendors supply reliable solutions by specifying requirements precisely. This is particularly important in C/S systems where performance may be slower than expected if it is not stated in the requirements.

Understand the training implications of a new application for both health care employees and programmers. Where possible, ensure that a new system has an intuitive user interface.

Consider outsourcing some of the mature systems to free-up staff to work on newer applications that can improve patient care and attract high quality resources to the organization.

E**Conclusions**

The main conclusion is that health care is a very active and fast growing market for C/S solutions. Below are some observations:

- The health services industry is a prime candidate for continued penetration of C/S technology. Not only is the technology well-matched to the industry's core applications requirements, but industry pressure to reduce costs and re-engineer existing systems will continue to open the door for new and innovative uses.
- Given that few applications are outsourced and there are major mainframe applications in many hospitals and hospital management organizations, there is a significant opportunity to replace aging servers with more cost-effective technology. However, vendors will have to provide a complete solution for migrating applications away from mainframes and work with central IS, that may resist change.
- The case studies indicate there is considerable caution in accepting new technology. Emerging vendors must work to create credible reference accounts and partner with existing players in the health services market.
- All subsectors of the industry appear to be looking to C/S technology as a key component of their systems environments.

III

Applications Analysis

This chapter analyzes health services applications in detail. It contrasts C/S applications with non-C/S applications.

- Section A discusses health care applications trends.
- Section B discusses leading IS issues as reported by respondents.
- Section C discusses user concerns
- Section D discusses C/S applications. It estimates the percentage of new, implemented systems using a C/S architecture and describes opportunities for C/S applications.
- Section E discusses target platforms (i.e., mainframe, minicomputer or LAN).
- Section F shows how the systems environment is changing.

A

Health Care Applications Trends

INPUT's *Health Services—Information Services Opportunities and Trends, 1993-1998* identifies health care industry trends, in more detail, that have significant implications for developers of C/S information systems:

- Change in payment mechanisms
- Increased competition for market share
- Increased emphasis on physician evaluation and quality improvement
- Growth of integrated health care delivery systems

In addition, the following trends are noted with respect to how C/S technology is being delivered to the health care market:

- C/S software vendors are moving into the health services market.
- Image processing is being integrated with patient care systems using C/S technology.

Change in Payment Mechanisms

Traditionally, payment to health care providers was on a cost-plus basis, which reduced the incentive to scale down expenditures. In fact, this mechanism often encouraged providers to opt for more expensive alternatives. Cost-plus reimbursement, however, is being replaced by prospective payment system (PPS) by Medicare, which accounts for 25 to 50% of hospital revenues. Under PPS, Medicare pays a fixed amount, set in advance, for each inpatient hospital case, according to one of 467 diagnostic related groups (DRGs) where a case is classified. As a result of this change in payment systems, health care providers are placing a great emphasis on cost control, and look to information system solutions to help with this effort.

Increased Competition for Market Share

Currently, health care providers are experiencing a surplus of hospital beds. This is caused by improved treatment technologies which have led to a reduction in average length of stay (ALOS) for patients. As a result, providers are fighting to maintain market share, especially in highly competitive markets. Cost-effective pricing of services and products has become a paramount factor. A C/S integrated information system can help providers with pricing issues.

Increasing Emphasis on Physician Evaluation and Quality Improvement

Another hypothesis is that improved quality may also help reduce costs. Managing quality, however, will require C/S information systems where cost-effective practices can be targeted and disseminated. If systems that evaluate the quality of physicians' care are in place, then it is likely costs can be reduced.

Growth of Integrated Health Care Delivery Systems

Competitive factors have also forced providers to integrate vertically and offer a variety of patient services. To take advantage of the potential of C/S delivery systems, provider organizations must develop (or buy) information systems that link the systems different levels and components. This would allow for system-wide contracting, human resource planning (including physician and nursing services), financial planning and control and clinical quality and utilization control. In C/S systems, information about the patient may be collected and stored in multiple locations and in multiple institutions. To avoid redundancies in data collection and fragmentation of information, information systems must effortlessly link all elements of the health care organization.

C/S Software Vendors

Traditionally, hardware vendors, system integrators and specialty medical systems vendors have served the health care market. Now, client/server software vendors like PeopleSoft, are entering the health care market. Many software vendors are turning to vertical markets as competition intensifies.

Established vendors have to support the installed base, hence, there is a window of opportunity for two or three new vendors, with strong technical solutions, to specialize in the medical market. However, many C/S vendors will not be able to afford to support the market and may be more successful partnering with established vendors. For example; development tools vendor, ParcPlace, has partnered with Andersen Consulting and HBO.

Image Processing

In health care, there are two main categories of images. The first is medical images that come from X-rays, MRI scans and microscope slides. These images are used for diagnosis. The second kind of image is a document image. The medical image needs to be high quality to detect abnormalities, whereas, document images may be lower quality resulting in smaller images. In both cases, server systems, able to store images that can be retrieved on request, are required. Client workstations that combine traditional data processing records with images are starting to be used.

B

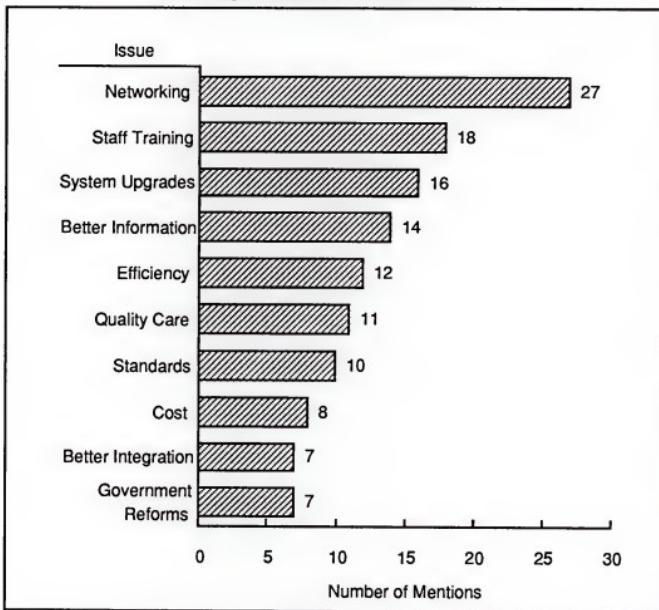
Leading IS Issues

Ranking of Leading IS Issues

When asked to identify the major issues relevant to IS in the next two years, respondents gave free-form answers that were coded by INPUT. Most respondents only identified one issue and a few were unable to identify any key issues, giving 130 responses in total.

EXHIBIT III-1

Leading IS Issues—Health Services



Total Respondents: 130

Discussion Of Issues

In general, respondents identified organizational issues such as staff training and quality care, rather than technology. Key issues shown in Exhibit III-1 are discussed in detail below.

- *Networking*—All sizes of health care organizations, including doctors' clinics are concerned about how their systems can be connected using data networks. For both internal and external communications, organizations were concerned about network performance, reliability and applications support.
- *Staff training*—This refers to training of medical staff in IS technology. The health services industry is populated by specialists such as doctors, nurses and pharmacists. Some organizations are reluctant to train health care professionals in computer technology and choose to augment their staff with computer professionals. Other organizations prefer to train nurses and doctors to use computers and recognize that C/S systems, with simple user interfaces, empower medical staff with new information.
- *System upgrades*—The need to upgrade existing systems to handle new requirements or increased capacity is a key concern. This is particularly true in applications that require high capacity computers and networks to support digital images of MRI scans, X-rays or documents.
- *Better information*—Information on patients, medical conditions, availability of beds, schedules and diagnoses can all be improved with client/server networks. In this category, we also included answers that referred to better user interfaces to access information. Several respondents identified the need to get higher quality and more timely information. They also wanted to be able to compare records. Lacking proper information, treatment may be incorrectly prescribed or delayed.

The applications where access to information or friendly user interfaces were mentioned as issues are:

- Laboratory systems
- Donor tracking

- Bedside patient care
- Patient information and records
- Pharmacy support
- Nurse scheduling
- *Efficiency*—A key to keeping hospital costs low is to run operations efficiently, thereby minimizing waste and optimizing schedules.
- *Quality care*—Several respondents mentioned that with the right computer systems, they would be able to give higher quality care. Respondents at different stages in a patient's hospital stay had a variety of concerns from quality care to admissions to bedside care to radiology.
- *Standards*—The adoption of common standards for interfacing and programming hardware, software and applications is less of a concern than getting practical results. Standardization of hospital information systems typically means standardizing interfaces between systems, rather than providing common platforms throughout an institution. A major area for standardization is in the area of electronic forms, either document images or data fields, typically in databases and EDI systems. There are three main areas where users mentioned standardization of electronic forms as being an issue:

- Claims processing
- Patient records
- Hospital purchasing and ordering systems

Already, much work has been done on standardizing forms design through the Health Care Financing Administration (HCFA). A major challenge is to network doctors, hospitals and claims form processors with compatible interfaces.

- *Cost*—Given the government's movement to reduce health care costs, it is surprising that cost was only mentioned by a few respondents. Most respondents were more concerned with reliable systems, rather than inexpensive systems.

Managed care systems with ceilings on medical fees, create hospital competition. Given the high administrative costs of some institutions, office systems is a key area where hospitals strive to keep their costs down. Applications being upgraded to remain cost competitive include:

- Billing and payment processing
- Electronic mail
- Word processing

In addition, hospitals are building better decision support and budgeting systems to manage cost containment.

- *Better Integration*—Traditionally, hospital complexes have supported many different systems. With the advent of affordable networking, better integration of systems and applications software becomes a key issue. The main area of activity is in departmental systems which traditionally have not been integrated with core hospital operations systems. Pharmacy, laboratory, radiology and office systems are being integrated with centralized computers.
- *Government Reforms*—There are three main areas of government intervention that affect the health services systems analyzed in this study. One is forms standardization that affects EDI and electronic forms processing systems. Another is managed care that requires information systems to be in place to support government regulations. The third is Medicare (federal government) and Medicaid (state government) systems that need to support government payment standards.

The main applications respondents mentioned as the most likely to be affected by health care reform are:

- Billing and accounting
- Claims processing
- EDI

Recent government initiatives are forcing hospitals to dramatically reduce costs. In anticipation of health care reforms, medical providers are focusing on:

- Reducing paperwork
- Improving communications
- Implementing decision support systems

Several respondents in the survey are designing modular systems that can be rapidly upgraded to meet any future government requirements.

C

User Concerns

From the case study interviews, the survey and secondary sources, INPUT identified several concerns of medical organizations as they move to C/S systems.

Efficient Data Storage

Hospitals want to create efficient databases large enough to accommodate all their data needs for reasonable levels of investment. This problem is becoming more pronounced as hospital information demands explode in the managed care environment. To meet this need for data storage, many hospitals are moving toward logical "information warehouses," where information residing in multiple, independent databases can be accessed from client computers anywhere in the system.

Departmental and User Commitment

A major goal of distributed computing is to get information to users in real time and in a useful form. A common complaint among users in centralized systems is that MIS personnel do not understand subtle clinic or hospital business needs. As a result, centralized decisions on departmental and user information systems are notoriously unsatisfactory to most users. In addition, single vendor solutions often represent a compromise that makes no one happy.

Users, both clinical and managerial, are demanding ease of access, flexible query and processing options, on-line information

display and sensitivity analysis and intuitive graphical user interfaces. They do not have the time to go through highly structured methods and procedures or to wait for MIS personnel to process their information requests. In today's competitive health care market, improved information access is viewed as essential to making better and faster decisions and improving productivity.

Vendor and Growth Flexibility

Another advantage of a client/server system frequently mentioned by respondents is modular system implementation. This allows application systems to evolve. System replacements are made as they are needed, not just because the hospital has decided to replace the existing hardware platform. In addition, individual departments have a great deal of flexibility in selecting hardware and software applications that meet their specialized needs. Because of the smaller scope, hardware and software modifications to individual systems is much easier and less costly.

Minimize Risk

There is considerable instability within the Health Care Information Systems industry. Many vendors have gone out of business and most others are experiencing significant change. Centralized, mainframe solutions entail large up-front expense, and a bad decision or major technology change, jeopardizes the entire information system. Client/server systems with multiple vendors offer the advantage of diversifying vendor and technology risks and reduce up-front expenditures.

Client/server systems also reduce the risk of system failures. Unlike mainframe solutions, if one component goes down, other components are unaffected. In addition, the system does not require any planned downtime.

Fit with Hospital Culture

A phenomenon unique to health care is that physicians, who largely control patient care, are not directly responsible to hospital management. In most hospitals, departments operate semiautonomously, especially clinical departments run by physicians. As a result, most hospitals have seen the

proliferation of standalone computer systems in many hospital departments. Client/server computing fits more easily with the decentralized decision making process.

Lack of Standards

A major hurdle in any client/server computing environment is system integration and coordination. This is a particularly vexing problem in health care because of the lack of standards. There is a pressing need for standards at all levels: physical hardware connections, data-transmission protocols, data formats, medical terminology and nomenclature and user interfaces.

Efforts to develop standards for health care computing are taking place at a number of levels. The Institute for Electrical and Electronics Engineers (IEEE) has defined standards for a medical information bus (MIB) to facilitate automated collection and integration of data from independent bedside instruments (such as those found in an intensive care unit) by providing a standard hardware interface and data communications protocol. The IEEE has also developed the Medical Data Interchange (MEDIX) for interconnecting heterogeneous systems supporting a wide range of applications.

A committee of the American Society of Testing Materials (ASTM) has defined standards for the representation, storage and transmission of clinical laboratory data, and work is underway to extend these standards to other types of clinical data. Hospitals, consultants and information system vendors have worked closely with ASTM on Health Level 7 (HL-7), a standard for transmitting data for billing, ADT functions, order entry and results reporting within hospitals. The American College of Radiology and National Electronic Manufacturers' Association has developed a standard for storing digital radiographic images.

Despite the considerable progress of these groups, current standards still do not permit full system integration or interoperability between applications. Health care organizations must still go through a series of significant integration steps to

link independent systems or applications. In general, none of the standards currently support, nor specify, how to provide the following:

- Transparent access to and the ability to combine data from different applications, wherever they reside
- Common user interfaces and presentation standards
- The ability to run any application from any terminal or workstation
- Transparent switching and sharing of data between applications

Management Support for Distributed Systems

Most MIS personnel were trained in a mainframe environment. They are typically unfamiliar with client/server technology and distributed computing and may lack the management experience to make those systems work.

Security and Data Integrity Issues

Open, integrated health care information systems raise concerns over unauthorized access to data. The fear is that competitors could access data and use it against a physician or hospital, or that confidential patient data could be obtained. While this issue was a concern for the managers INPUT interviewed, most felt technology was available to deal satisfactorily with the problem. In addition, distributed systems raise data integrity concerns, since several sources may potentially corrupt data.

Hidden Costs

At least one organization we interviewed was adamant that hidden costs, associated with the introduction of distributed systems, was a major barrier to adoption of C/S systems. These hidden costs include database migration and training.

D

Client/Server Applications

Client/Server Penetration by Application Category

C/S systems will achieve high penetration rates in the health services industry over the next few years. Respondents were asked if they were using or planning to use client/server systems. Exhibit III-2 shows the number of applications in each category (of the applications categories) given in Exhibit I-2. It also shows the number of those where the respondent indicated the C/S would be a major strategy.

Though not as pervasive in health services as in the manufacturing sectors, on average, C/S architecture is targeted for 84 of the 200 applications, or more than 40% of the systems.

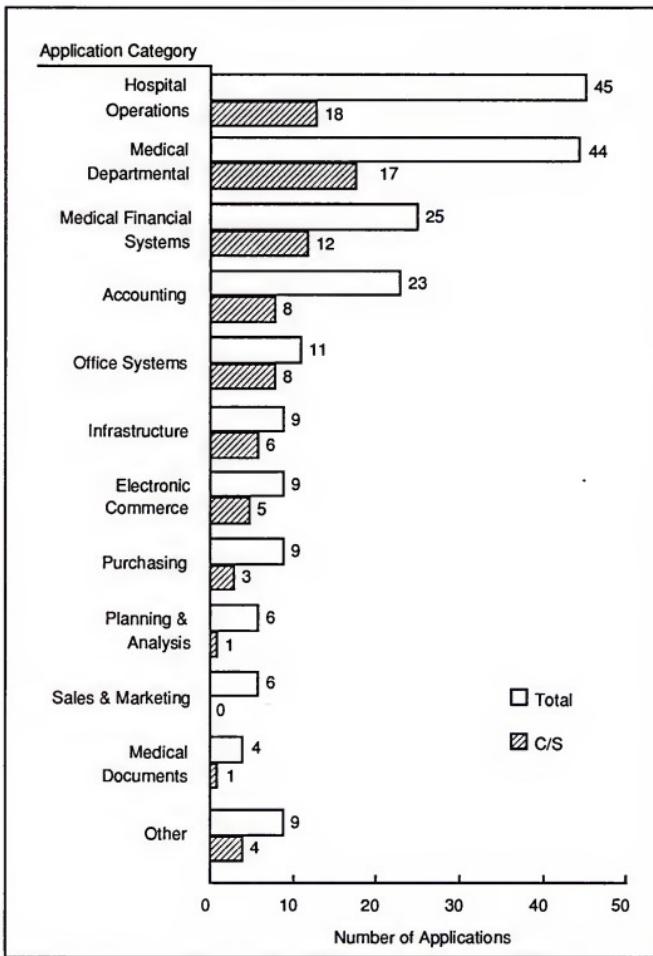
Approximately half of the sample comprised:

- Hospital operations systems
- Medical departmental systems
- Medical billing systems

For these key health care systems, the percentage using a C/S architecture was again, approximately 40%, showing that in major medical systems, there is a strong trend toward client/server systems.

EXHIBIT III-2

Planned Application Changes and Use of C/S by Category Health Services

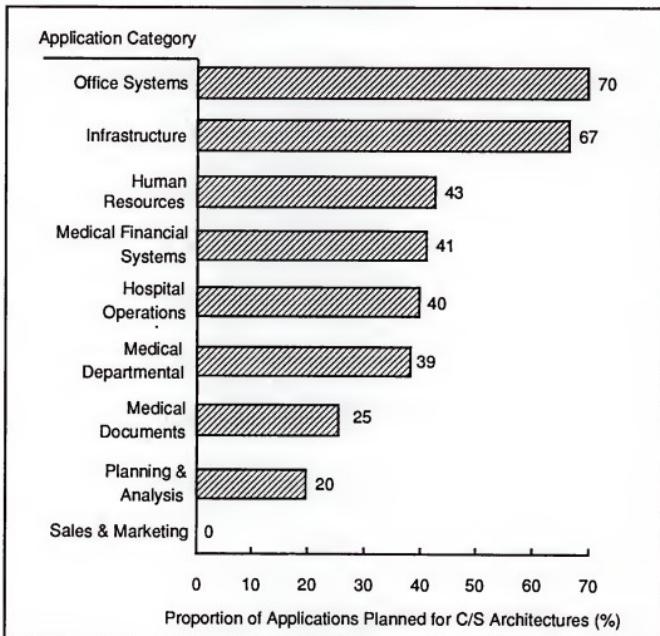


Total Respondents: 124

Exhibit III-3 takes the same data as Exhibit III-2 and expresses C/S penetration as a percentage of systems installed for each application category. The application categories are then ranked according to the percentage of systems that are migrating to C/S architectures.

EXHIBIT III-3

**Use of C/S by Application Category
Health Services**



The following are categories found in the chart and explained in detail, suggesting opportunities for system vendors.

Office systems, in particular, electronic mail systems, are strong candidates for client/server implementation. The high penetration of C/S systems (73%) reflects the fact that hospitals are integrating their administrative departments with other hospital

information systems. In particular, office LANs that run word processing and electronic mail are being extended to integrate with other parts of the enterprise.

To support C/S systems, many hospitals need to upgrade their *infrastructure*. Several respondents mentioned they were upgrading their data networks. A few were upgrading servers, in particular, minicomputers.

Several hospitals mentioned they were adding EDI to existing systems using a C/S architecture, hence the explanation for 56% penetration of C/S in *electronic commerce* systems.

Medical billing systems are undergoing massive re-engineering efforts and 40% are estimated to be C/S systems. Having patient billing records available at multiple locations in the hospital is a key goal of billing system re-engineering. For example, patients may need to know their billing status when they are at the front desk as well as when they visit a specialist in another hospital office. In this case, the front-desk receptionist and specialist's receptionist need access to an integrated billing system.

Medical documents are notoriously cumbersome to handle, despite concerted efforts by government, payment processors, insurers and medical institutions to reduce paperwork. Many of the document handling systems track document workflow. Some are document imaging systems.

Departmental systems, such as radiology, laboratory and pharmacy systems are also moving toward C/S implementation as they become integrated with hospital records systems.

Planning and analysis systems are the least likely to be C/S-based. This is because most of the respondents indicated they were purchasing single-user, PC-based planning systems or spreadsheets that do not integrate with other systems.

Client/Server Applications

Exhibit III-4 shows estimated C/S penetration for leading health care applications broken out from the application groups described in Exhibits III-2 and III-3 above. These particular systems were selected because there were at least nine respondents for each application.

EXHIBIT III-4

Penetration of C/S for Leading Health Services Applications

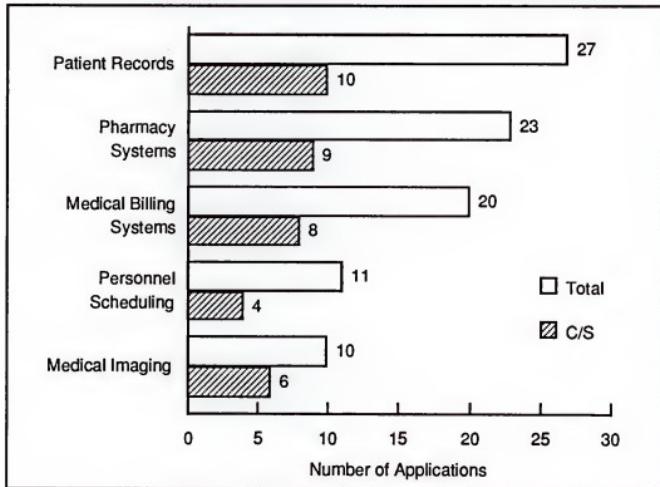


Exhibit III-5 ranks the same applications by their proportionate use of C/S technology. Specific applications that rank high on the list include:

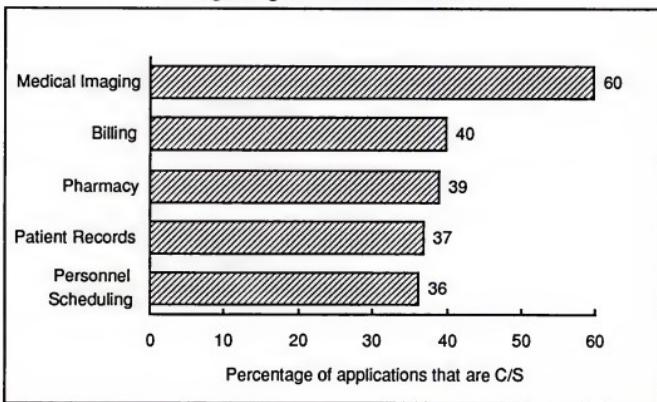
- Medical imaging
- Medical billing systems

Medical imaging systems require an image server with high bandwidth and gigabytes of storage to manage the massive files generated by medical systems.

Billing systems frequently have to integrate data from massive databases that include patient record and claims processing data. Hence, a C/S architecture can be used to combine records from different systems. Also, many billing systems are old and complex to maintain so, by migrating the architecture to C/S modules, the systems can be updated gradually to more modern databases.

EXHIBIT III-5

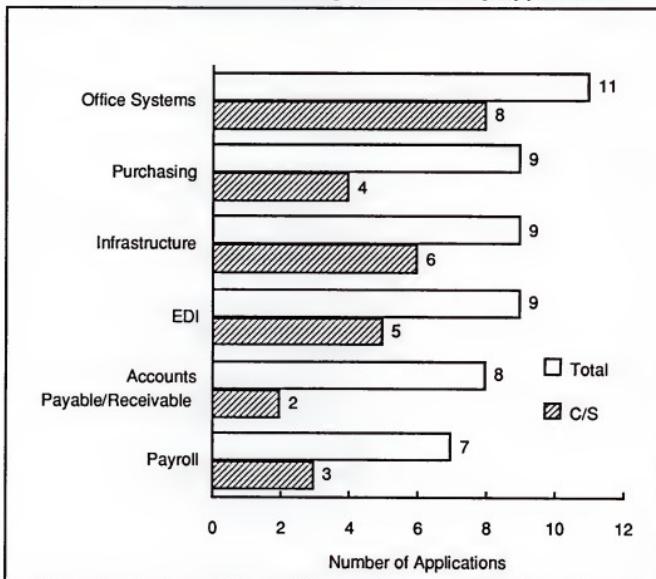
**Percentage of Leading Health Services Applications
Migrating to C/S Architectures**



Besides specific medical systems, cross-industry applications are being implemented on C/S platforms. Exhibit III-6 shows the number of times each cross-industry application was mentioned in the survey, with the number that planned to migrate to C/S below it.

EXHIBIT III-6

Penetration of C/S for Leading Cross-Industry Applications



Office systems are clearly a key application for C/S implementation, as are purchasing systems. There was less interest in C/S accounting systems than in other industries. This may be because hospitals sometimes procure their systems from specialty hospital system suppliers rather than mainstream accounting vendors, almost all of whom offer at least one C/S solution. Accounting systems are expected to require major upgrades over the next few years and represent an opportunity for leading edge vendors.

Exhibit III-7 shows the same data as in Exhibit III-8, except the percentage of C/S systems is presented as a percentage of the total surveyed. Leading horizontal applications found in the health services market are:

- Office systems
- EDI
- Purchasing systems
- Payroll systems

EXHIBIT III-7

**Percentage of Leading Cross-Industry Applications
Migrating to C/S Architectures**

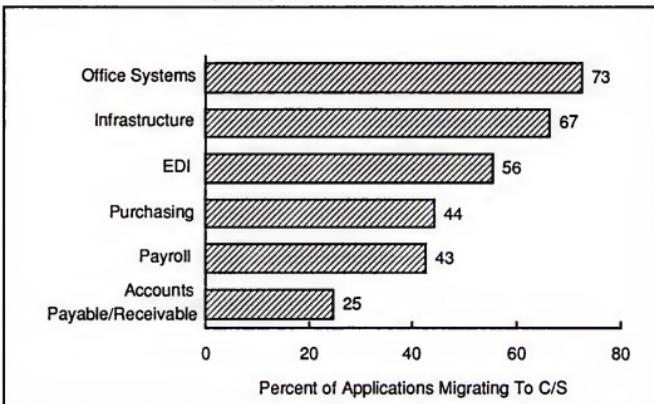


Exhibit III-8 gives a detailed breakdown of the data collected. It shows for each category, the number of applications, the strategy and the main platforms and major resources used.

EXHIBIT III-8

Detailed Data from the Industry Survey

Application Category	Strategy		Platform			Resources						Using EDI	Outsrch	
	Num. Apps.	C/S	Down-sizing	C/S or LAN	Mini	Main-frame	Corp. IS	Div'l IS	User Staff	SI	Other Outside Svcs.	Packaged SW		
All Applications														
Other	8	4	1	1	2	3	6	1	3	0	5	2	2	0
Planning & Analysis	6	1	1	4	1	2	3	4	1	3	2	3	2	0
Human Resources	8	3	0	0	2	4	6	2	3	2	4	5	3	2
Sales & Marketing	6	0	1	0	0	2	4	2	3	1	3	2	3	0
Electronic Commerce	9	5	0	2	0	6	7	3	3	1	4	2	9	0
Purchasing	9	3	3	1	2	4	5	2	5	1	5	4	9	1
Office Systems	11	8	0	8	5	4	7	4	4	4	2	8	3	0
Medical Documents	4	1	2	0	0	3	2	0	0	1	1	1	3	2
Infrastructure	9	6	1	3	0	5	7	2	3	0	3	3	4	1
Cross Industry Financial	16	5	2	3	0	8	10	4	3	3	6	10	5	3
Medical Financial Systems	25	12	5	4	3	15	15	4	11	7	12	11	12	7
Hospital Operations	45	18	3	15	6	21	34	16	23	4	19	25	18	2
Medical Departmental Systems	44	17	2	16	8	11	24	12	19	1	20	13	15	1
TOTAL - All Applications	200	83	21	57	29	88	130	56	81	28	86	89	88	19
C/S Applications Only														
Other	4	0	1	0	2	1	0	0	0	0	4	1	2	0
Planning & Analysis	1	0	1	1	1	1	1	1	1	1	1	1	1	0
Human Resources	3	0	0	0	2	2	0	1	0	1	1	2	1	
Sales & Marketing	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Electronic Commerce	5	0	1	0	4	4	1	0	0	0	3	0	5	0
Purchasing	3	1	1	1	1	1	1	1	0	1	1	3	1	
Office Systems	8	0	6	4	3	4	4	4	4	4	2	7	2	0
Medical Documents	1	1	0	0	1	0	0	0	0	0	0	0	1	1
Infrastructure	6	1	3	0	2	4	1	2	0	3	3	4	1	
Accounting	5	2	1	0	1	5	2	1	0	2	4	1	1	
Medical Billing Systems	12	4	4	1	8	7	2	5	2	5	4	8	6	
Hospital Operations	18	2	8	4	11	15	9	8	1	9	8	11	1	
Medical Departmental Systems	17	1	6	5	6	8	5	5	0	7	2	6	0	
TOTAL - C/S Applications	83	12	32	16	42	52	26	28	8	38	32	46	12	
Percentage for all applications	100	42	11	29	15	44	65	28	41	14	43	45	44	10
Percentage for C/S applications only		100	14	39	19	51	63	31	34	10	46	39	55	14

An explanation of the column headings follows:

- "Number of Applications" is the total number of applications for each of the application categories.
- The "Strategy" heading contains two subheadings, "Client/Server" and "Downsizing." The "Client/Server" count by category indicates the number of applications within the category that will be implemented using a C/S architecture. The count under the heading "Downsizing" represents the number of client/server applications out of the total that are being implemented as part of a general downsizing strategy.
- The "Platform" heading indicates the number of times that one of the three major platform classes was mentioned as the key implementation platform.
- The "Resources" heading covers six sources of potential resources that will be employed as part of the implementation process. More than one response per application was permitted.
- Finally, for each application, respondents were asked to indicate whether the application would use EDI or be outsourced. The last two columns give a tabulation of those responses.

An explanation of the rows is as follows:

- The first set of rows represents the leading application categories.
- The "TOTAL - All applications" row adds up the rows describing the application categories.
- The above rows are repeated for applications where the respondent indicated there was a major strategy to move to C/S systems.
- The next to last row takes the "TOTAL - All applications" and divides each column total by the number of applications to give a percentage. The final row calculates a similar percentage for C/S applications, so they may be compared with the population as a whole.

Observations on the Sample Mix

In analyzing the C/S applications in the above table the following observations can be made:

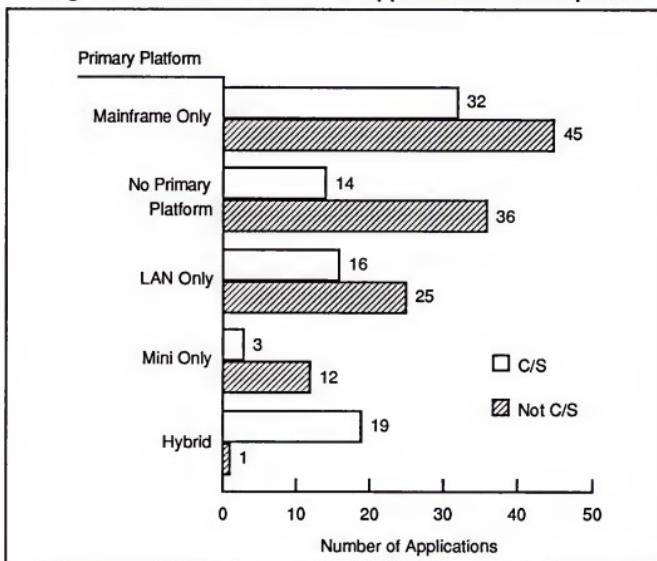
- According to the above results, 14% of C/S applications are likely to be outsourced, compared with 9% for the sample as a whole. This suggests a system integrator has the opportunity to offer outsourcing when integrating C/S applications.
- In general, applications are more likely to be built on a mainframe or LAN than a minicomputer. However, 19% of C/S applications are likely to be built using minicomputers where, in general, only 13% of the applications will be built on a minicomputer. This suggests that minicomputers are being given an extended life by using them as servers in a C/S network.
- Users are less likely to be involved with C/S applications and outside services are more likely to be used for C/S applications.

E

Target Platforms

Exhibit III-9 shows the target platforms for the 200 applications where platform information was available. Users were asked to identify their primary application platform for applications undergoing major changes. There were 173 mentions of a primary platform. Some respondents did not specify a platform, others specified multiple platforms. For example, a single application could be on both a LAN implementation and a mainframe. Three respondents specified they were implementing a multi-tier C/S system with LAN minicomputer and mainframe.

EXHIBIT III-9

Target Platforms for Planned Applications Development

Overall, 40% of the identified applications will use mainframes as some component of the target platform. These are not necessarily all IBM mainframes—many are HP and DEC machines. The health services market is behind other industry segments because many medical institutions are reluctant to replace their mainframes.

Approximately 27% of applications will use a C/S or LAN architecture as the primary platform. Networking implementation is behind in the health services field compared with some of the other industry sectors. Minicomputers will be platforms for a mere 13% of applications.

An analysis of platform by institution size indicates minicomputer-only solutions are found in the smaller organizations with less than \$500 million in annual revenues.

Larger organizations are much more likely to integrate LANs with existing computers.

This distribution of platform combinations is similar to that of the banking and finance sector. A significant difference is that there is a much higher proportion of C/S systems planned—40% in health services compared with 23% in banking. The following are some reasons for the higher acceptance of C/S solutions.

- Health care environments have lower transaction volumes than banking, making C/S solutions more suitable. This is because many C/S systems are currently slower than high-speed, non-stop transaction processing systems required in banking.
- Banks have been slow to adopt C/S solutions because the solutions do not address the security constraints banks require. Medical institutions are not as security conscious as banks. They are, however, privacy conscious.
- Health care systems are traditionally decentralized making C/S technology ideal for integrating different types of systems.
- Medical data will become more multimedia-oriented than banking data because of the increased use of medical imaging, speech annotation of documents and the need to display diagnostic data graphically. Client/server systems are ideal for supporting multimedia.
- Examination of the survey data by geographic region shows many of the sites mainframe and minicomputer platforms predominate, are away from major metropolitan areas. LANs connected to minicomputers and mainframes are more likely to be found around major cities and along the East and West Coasts.

F

Anticipated Changes in the Systems Environment

Respondents provided information on specific changes in their systems environment over the next two years. Responses fell into four categories.

Upgrades

Seventy-two percent of the respondents anticipate they will be upgrading their systems over the next two years. Of those that want to upgrade, 33% are moving to client/server systems. This is lower than the sample estimate of those moving to C/S systems.

When the sample is analyzed on the basis of institution size, 73% of respondents in smaller organizations (less than \$1 billion in sales) are considering upgrading their systems, as a key strategy, compared with 67% (cf. 31% in insurance) in larger companies. A significantly higher percentage of health care applications are being upgraded than in more conservative markets like insurance.

Increased/Decreased Standardization

Movement toward increasing standardization in platforms and operating environments was predicted by 41% of the respondents, and only one respondent anticipated any decrease in standards. Standards are likely to hurt vendors by increasing competition and driving prices down. Some standards are emerging already. For example, HL7 is becoming the standard for LAN communication.

Another aspect is external pressure for standardization. For example, the Health Care Financing Administration (HCFA) will pressure for standardized billing services.

Migration to C/S

A significant proportion of health care respondents (40%) are adopting C/S migration strategies. Distributed networks must also be completely transparent—systems must be intuitive.

Downsizing

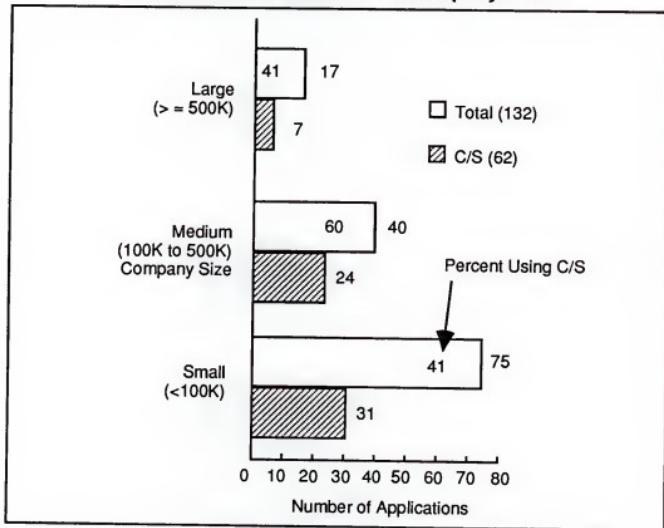
Only 10% of applications are being downsized which is not a major strategy in the health services market. However, there is definitely a move toward it. Established hardware and software vendors are aware of downsizing, but interviews for the case studies in Chapter V found there was a strong resistance to it in some organizations. Hospital information services professionals are certainly not pushing for downsizing in most instances. They are used to mainframes and controlling information. Mentality is

the biggest barrier to downsizing, not technology. Mainframes are unlikely to go away in the next ten years in the health services market—they will act as data repositories.

G**Client/Server Implementation by Company Size**

Companies were divided into large; greater than \$500 million in annual revenue, medium; between \$100 and \$500 million in annual revenue and small; less than \$100 million.

Of the 136 companies interviewed, 47% indicated they were moving toward a C/S strategy. Data from 132, shown in Exhibit III-10 below, shows that C/S implementations are more likely in medium-sized institutions—the probability of having a C/S strategy being 60%, compared with 41% for the larger and smaller companies.

EXHIBIT III-10**Use of C/S as a Function of Company Size**

IV

Management and Budgets

This chapter discusses how applications are managed. It also addresses budgets. The chapter is organized as follows:

- Section A provides an analysis of the role that IS departments and user management play in managing applications.
- Section B analyzes resources that will be used to implement applications, with the emphasis on development rather than overall project management.
- Section C gives estimates of expenditure plans.

A

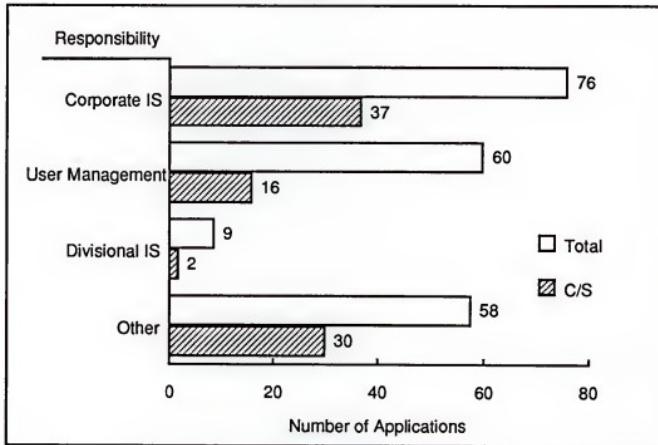
Project Management

The responsibility for project management divides, almost equally, into central MIS, user management and "other". Most of the respondents in the "other" category indicated that the applications project management was carried out by a committee representing both user and IS organizations.

- Thirty percent of the respondents' projects will be managed by user management. This is approximately double that for the discrete and process manufacturing industry sectors. However, it is less than the 40% identified in an analysis of the banking and finance industry.
- Corporate IS will manage 37% of the projects and divisional IS will manage 4%.
- The remaining 29% will use another approach. In most cases, this means a joint committee of IS and users.

Of 200 applications, 83 are moving or have already migrated to client/server solutions. Exhibit IV-1 shows the project management responsibilities for the total number of applications and client/server applications. Exhibit IV-2 shows the same information on a percentage basis.

EXHIBIT IV-1

**Applications Development Project Management
Health Services**

Sample Size 203 Applications

As a percentage of applications, C/S is more likely to be managed by central IS or a joint committee of users and IS, than by user management. Only 19% of C/S applications will be managed by users, compared with 33% of applications as a whole.

EXHIBIT IV-2

Project Management for C/S Applications
Compared With All Applications Surveyed

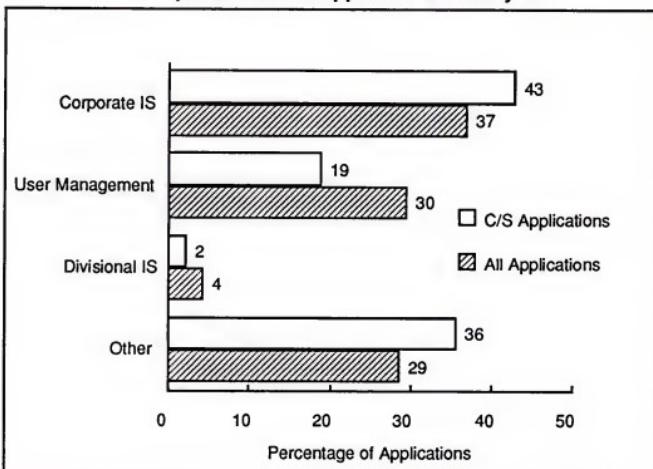
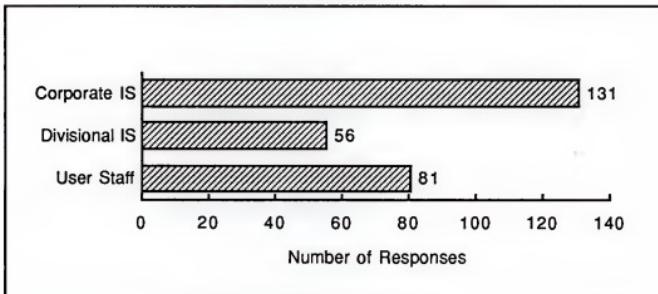
**B****Implementation Strategy****Sources of Development Resources**

Exhibit IV-3 shows the resources required to implement the 200 applications. In some cases, an organization was mentioned more than once. Corporate IS still plays a strong role in applications development in the health care sector, being mentioned 131 times.

EXHIBIT IV-3**Internal Sources of Applications Development Resources
Health Services**

More than 40% of the projects will be implemented with user line or staff management assuming direct project management responsibility. This is close to double the average number for the manufacturing industry sectors.

Size of institution is not a differentiating factor for project management strategy. Central IS continues to have a key role in systems management. Whether the organization is large or small, central IS a primary resource in more than 60% of the applications.

Use of Software Products and External Resources

As shown in Exhibit IV-4, more than 40% of the implementations planned for the next two years will use software packages.

EXHIBIT IV-4

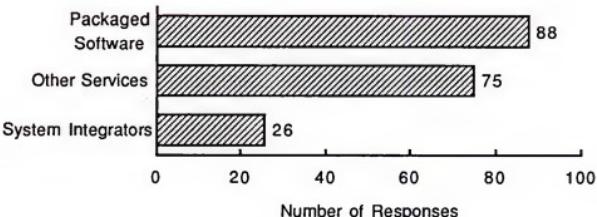
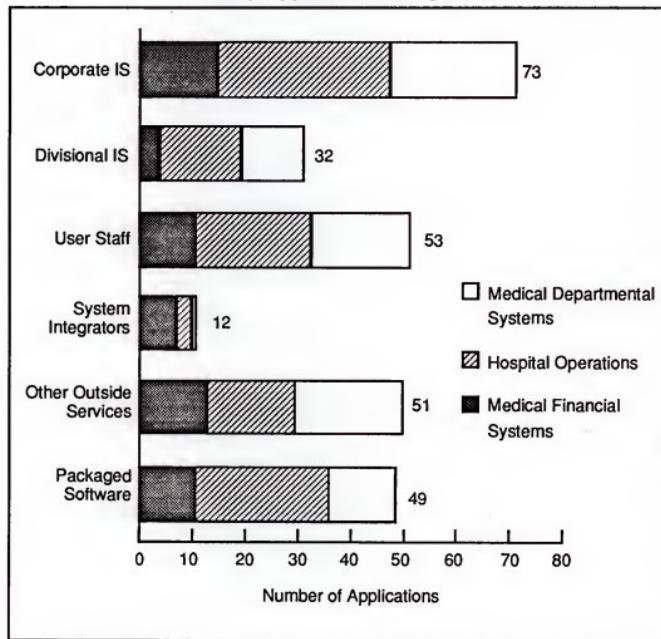
**Use of Outside Products and Services
Health Services****Resource Use by Application Category**

Exhibit IV-5 takes the major application groupings in the health services market and identifies resources used to implement them.

As can be seen, for each major application grouping, the number of times a particular resource was mentioned is tabulated. The height of each column measures the number of mentions of a resource and clearly, central IS is the most frequently used.

EXHIBIT IV-5

Resources Required to Implement Health Services Systems for Key Application Categories



The use of traditional systems integrators is low compared with other industries. This is because specialty software vendors, like HBO and Shared Medical Systems, supply the health care market with both systems integration and software. In particular, departmental systems are frequently installed by hardware manufacturers. For example, Hewlett-Packard makes medical equipment and can add a computer system as part of the sale.

C

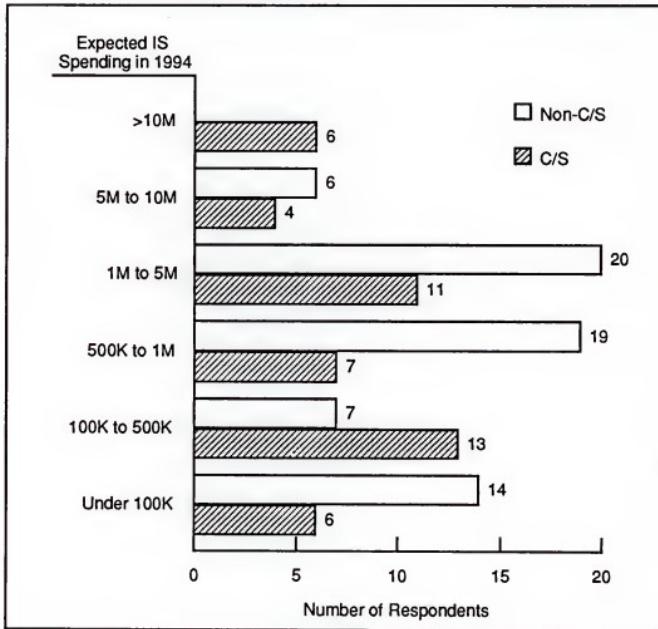
Expenditure Plans

Expenditure Plans

Exhibit IV-6 shows the anticipated amount each respondent expects to spend on applications changes in 1994. The spending amounts, shown as a range in \$K, are plotted against the number of mentions. The shading differentiates between respondents that mentioned C/S as a key strategy and those that did not (marked non-C/S). As can be seen in the \$100 to \$500 thousand range, a high proportion of C/S systems is planned. These are most likely pilot systems, given the size of the expenditures. At the top end of the range, the six respondents who indicated they would spend over \$10 million, all intended to implement a C/S strategy.

EXHIBIT IV-6

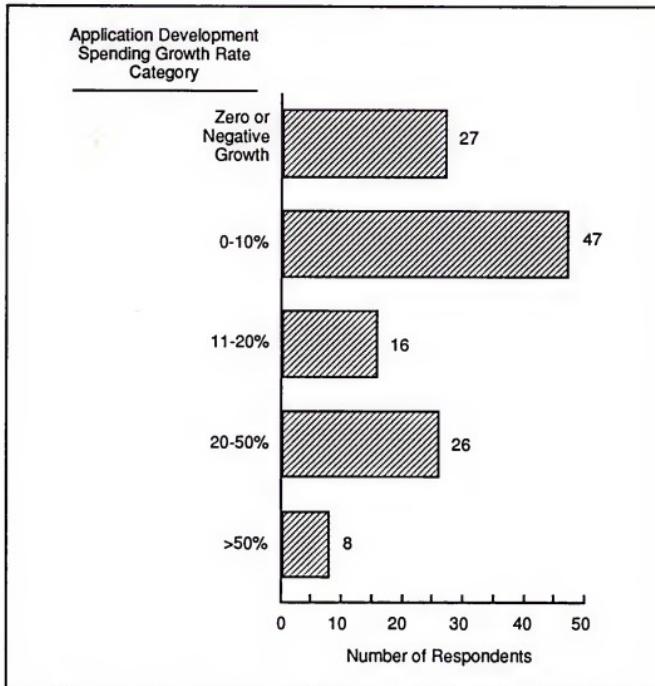
Comparison of IS Spending for C/S and Non-C/S Systems

**D****Budget Growth Rate****Growth Rates**

Respondents were asked how much their IS budget would grow annually over the next few years. They were also asked for the expected growth in their IS budget, excluding hardware and applications. Spending rates for both applications improvements and IS overall (this includes personnel costs, equipment upgrades and support) are above industry norms. On average, total IS and applications development spending are expected to grow at an annual rate of 18%.

Exhibit IV-7 shows the distribution of application budget growth rates. As can be seen, most respondents expected a 0% to 10% growth rate. However, 20% of the respondents reported a 20% to 50% growth rate.

EXHIBIT IV-7

**Annual Spending Growth Rates for Applications Development
Health Services**

Total Respondents: 124

Examining the data in more detail, the fastest growing budgets are for networking applications, including electronic messaging and EDI. Hospitals are upgrading their office systems networks while community networks are requiring information exchange between medical facilities. Office systems is a major growth area,

between medical facilities. Office systems is a major growth area, whereas, clinical records applications is growing at a slower pace.

With the exception of the largest organization, whose budget is growing at 50%, the highest budget increases are seen in midrange institutions. Organizations with sales between \$100 and \$500 million had a growth rate of 30% for the IS budget as a whole, and 40% for the applications budget. The lowest growth rates are in organizations with less than \$100 million in revenues, with growth rates averaging 11% to 12% for both IS and applications budgets.

V

Health Services Application Case Studies

This presents case studies based on interviews with three health services organizations. The organizations were selected because they show diverse activities that characterize the health care industry. The first two were cautious in their approach to client/server systems. The third was more aggressive and decided to jointly develop systems to remarket.

A

List of Interviews

INPUT interviewed professionals at the following institutions:

- El Camino Community Hospital, Mountain View, CA
- A major Northern California health care provider
- UniHealth

The above organizations had different levels of activity in client/server systems. For example, El Camino Hospital has a very low-level of activity. By contrast, UniHealth is further along in deploying client/server systems.

The organizations surveyed did not feel applications software vendors offered a wide enough range of packaged solutions. Thus, they must rely on internal resources or close cooperation with an outside vendor who can customize software to meet their needs.

B**Case Studies****Case 1—El Camino Hospital, Mountain View, CA**

This case study examines the information technology development effort at El Camino Hospital. El Camino is a 468-bed community hospital, with \$250 million in annual revenues. It services 20,000 patients a year.

History

Like most community hospitals, El Camino has not been very active in using leading edge information technology. El Camino currently has some mainframes in their terminology, (however, some may be considered minicomputers according to INPUT's definitions) running mission critical applications:

- A Prime computer for test laboratory applications
- An HP mainframe for critical operating room scheduling
- A DEC mainframe for the radiology laboratory

The mainframes are not currently interconnected. Aside from mainframes, desktop Macintoshes and PCs are scattered throughout the organization.

Motivation

El Camino realizes the need to downsize and adopt client/server applications. It has a Director of Information on board and is currently seeking to hire a full-time Chief Technology Officer (CTO). There are approximately 35 full-time employees working on IT related projects.

Major motivations for downsizing are to:

- Control costs
- Improve efficiency

Like many hospitals and other health maintenance organizations, El Camino has had difficulty tracking and controlling costs. It hopes a distributed computing environment will allow a better cost control and cost allocation process.

Another reason for downsizing is to improve El Camino's competitiveness. For example, El Camino hopes information technology will enable it to offer competitive, yet profitable, bids to groups of employers and win major health care contracts.

Finally, a distributed environment will help communications within organizations. Using a token-ring solution, a short-term goal is to connect all the Macs and PCs to support electronic mail in the first half of 1994.

Challenges

El Camino believes the migration from mainframes to a distributed computing environment will be a monumental task and a multiyear project.

El Camino lacks confidence in the ability of current personal computers or workstations to deliver the required performance. "There are gigabytes of data," one respondent said, "and workstations just don't have the MIP power to access and process the data." Mainframes are still considered by the hospital, to be the ideal platform for current mission critical applications.

El Camino requires new solutions and technology to display immediate and tangible results. Although the distributed computing environment shows promise, there is a lack of compelling client/server applications software available in the market.

Therefore, El Camino is considering developing future applications in-house. A major obstacle is the lack of financial and personnel resources.

Case 2—Major Northern California Health Care Provider

The following case study examines the information technology development effort in a major health care provider in Northern California. Current membership is around 2.5 million.

History

The organization annually processes 18 million appointments, as well as 25 million other administrative transactions. Distributed systems, which are best suited for compute intensive applications, are not perceived by the respondent as being efficient for transaction processing applications.

The organization operates mainframes from:

- IBM
- DEC
- Hitachi
- Tandem

For software, the organization has traditionally relied on in-house development which is judged to be more efficient for implementing application specific systems. Overall, there are some 90 production systems and database systems in use. The total database size is in the neighborhood of two terabytes.

There has been some experimentation with client/server applications. However, the mission critical applications still reside on mainframes, and migration to a distributed environment is not expected to occur any time soon. In fact, in some instances, applications were migrated back to a mainframe after users encountered problems on the distributed system.

Motivation

According to respondents:

- Distributed systems are almost an obsession these days.
- Implementing a distributed PC computing architecture is the latest fad.
- There is a considerable industry momentum to adopt distributed systems, without carefully considering all the important factors.
- There are adequate networking solutions to address connectivity concerns.

Challenges

One interviewee reported one of the best kept secrets in the industry is that mainframes are still more cost efficient than distributed systems. Although, on a cost/MIP basis, distributed systems are much cheaper than mainframes, and distributed

systems are still more expensive to implement when one factors in:

- Software
- Networking and integration effort
- Training costs
- Miscellaneous support activities

Another impediment toward the adoption of distributed systems is lack of appropriate tools to facilitate the transition of existing databases and applications (fairly large as described above), from mainframes to a distributed architecture. These tools would allow rapid and reliable implementation of the necessary data infrastructure.

In addition, some hardware technology is not quite ready to be adopted. Keyboard-based devices (small and portable PCs) are still not ideal. Pen-based devices will be better suited in most applications, but the technology is not yet ready. In addition, it takes too long to download data and software from a desktop computer.

Case 3—UniHealth

The following case study examines the information technology development effort at UniHealth — one the five largest nonprofit groups in the nation. It has 12 hospitals and several medical groups under its umbrella. Current membership stands at 2,000,000.

History

When it comes to information technology, UniHealth is one of the most progressive health care organizations. There is a Chief Technology Officer on board. Whereas, most of the hardware solutions are available in the open market, Unihealth has come to rely upon in-house, as well as outside expertise, to meet its software computing challenges.

As an example, UniHealth has a cooperative arrangement with GTE Health services and DSG (Decision Support Group Inc., Oakland, CA) to develop a comprehensive distributed computing

environment. The agreement will grant UniHealth exclusive rights to the technology in markets where UniHealth has a presence. However, both DSG and GTE will maintain marketing rights in other markets.

UniHealth used to heavily depend on mainframes to satisfy its computing needs. Currently, however, there has been a migration to minicomputers. Most notably, IBM AS-400 minis have proliferated in the organization. DSS is using Smalltalk to develop platform independent software tools. UniHealth envisions the software will run on networks of Intel-based PCs as well as the AS-400s.

Motivation

The top reasons why UniHealth is involved in down-sizing are:

- Cost
- Efficiency

UniHealth also believes down-sizing will bring critical and important information to management's attention and allow it to make important strategic decisions.

Another aspect of downsizing is the wide variety of choices available to customers. With the promotion of standards and open systems, customers do not have to rely on a single vendor to deliver products. Compatibility implies:

- Competition
- Lower prices
- Higher quality products

Challenges

One major barrier is lack of standardization. As noted earlier, UniHealth operates a number of hospitals and medical groups. The current organizational structure is complex, and computer

platforms are nonmonolithic. There are a variety of mainframes and minicomputers, running a range of applications, from:

- Sequent
- HP
- IBM
- Tandem

The coordination of the above machines and migration to a distributed environment will be very difficult.

Another challenge is to develop a comprehensive system, where everybody in the organization will use and profit from its benefits. Initially, a data model is being developed that lacks some critical features. In time, however, all the bells and whistles will be added. This incremental migration is likely to be successful in INPUT's estimation.

Another challenge is data collection. There is currently no formal mechanism to capture important information or data that will allow the development of state-of-the-art decision support tools.

There are also political battles to be fought. The distributed computing environment will imply the distribution of information. Therefore, people, for whom information was a prime source of power, are resisting change.

Finally, distributed computing will allow many sources to access and potentially update data. Therefore, data integrity and security issues are also a major source of concern.

With all the substantive progress made to date, people interviewed still thought it too early to tell whether down-sizing will be successful.

VI

Vendor Analysis

A

Survey Results

Vendor Moves Toward C/S Implementation

As part of the survey, respondents were asked to identify key vendors. These vendors were then given a satisfaction rating on a scale of 1 to 5, 1 being dissatisfied and 5 being very satisfied. In addition, the proportion of their customers who mentioned C/S as a key strategy was estimated. Given the very small sample sizes, results should be used to aid understanding rather than viewed as absolute measures. A tabulation of the named prime vendors is given below with some respondents noting more than one vendor. In all, there were 275 vendor mentions, many with a single mention only. Several regional, small vendors were reported. Only the vendors cited more than four times are analyzed in Exhibit VI-1.

EXHIBIT VI-1

Vendor Analysis Based on User Survey

Vendor	Number of Mentions	Average Rating	Migrating to C/S (%)	Notes
Apple Computer	4	4.8	75	All respondents noted ease of use.
CompUSA	4	4.5	25	
Compaq	8	3.9	50	Reliable, two respondents had problems with delivery.

EXHIBIT VI-1 (Cont.)

Vendor	Number of Mentions	Average Rating	Migrating to C/S (%)	Notes
Data General	4	4.5	25	Concern about the viability of the vendor from one respondent, otherwise satisfied with products.
Digital Equipment	24	3.8	42	Many medical departmental systems and financial systems
Dell	10	3.6	20	Problems mentioned with disk reliability in 2 cases, one was a laptop.
Gateway 2000	7	4.3	14	Generally purchased PCs for the price.
HBO	6	4.3	17	Four respondents mentioned that the product was excellent, support costs and aging software were mentioned as problems.
Hewlett-Packard	17	4.2	59	Several respondents had purchased HP systems together with medical equipment.
IBM	57	3.8	42	Weaknesses mentioned were poor connectivity and expensive support, otherwise most users were satisfied with products ranging from PCs to mainframes to major claim forms processing systems.
Meditech	4	4.3	0	
NCR	4	4.5	25	The company's flexibility and willingness to satisfy customers was mentioned by two respondents.

In general, hospitals were reluctant to purchase C/S systems from smaller regional vendors. The main drivers of C/S are companies like Digital Equipment, HP and IBM. A recent trend is the purchase of personal computers from companies like Dell, Compaq and CompUSA. In particular, Dell's telephone support is often superior to the onsite support provided by traditional hardware manufacturers. This is because Dell staff have knowledge of many PC applications.

Several established health care systems vendors, like Shared Medical Systems, were mentioned two or three times. However, in most cases, none of these supplied companies that planned to migrate to C/S. Vertical market software architectures lag the mainstream database market, and one can expect niche vendors to upgrade their software quickly. Indeed, major vendors, like HBO and Andersen Consulting, are supporting innovative object-oriented software for the health care market.

B

Emerging Vendors

This section features a small selection of innovative vendors that are developing solutions for the health care market. They are selected because their products are leading edge and offer solutions.

Kurzweil Applied Intelligence

Waltham, MA

For several years, Kurzweil has been developing speech recognition technology. It is having some success with systems for specialized medical dictation for the following applications:

- Emergency medicine
- Diagnostic Imaging and Radiology
- Surgical and Anatomical Pathology
- Invasive Cardiology
- Nephrology

- Family Medicine
- General Reporting

The company believes its main constraint to accurate recognition is the availability of fast computer processors. As the power of desktop computers increases with Pentium and PowerPC processors, speech recognition can be expected to prove practical.

Kurzweil's system runs on a client PC and can be interfaced to other systems using a Novell network. It can then keep its knowledge base on a Novell server.

Med-E-Mail

Tarrytown, NY

Will offer a wireless messaging system for doctors using hand-held devices with a system designed to integrate into existing systems. This is an example of a system that supports mobile clients.

NeXT Computer

Redwood City, CA

Formerly a hardware manufacturer, NeXT is vying to capture some of the health care market with its object-oriented operating environment. The system enables friendly user interfaces to be developed on a 486-based PC.

The NeXT environment enables rapid application prototyping, with its disadvantages being that programmers have to learn a new development environment. Recent support from HP, who will market NeXT software on PA-RISC workstations, means that NeXT's object-oriented development environment is now being considered as a platform for medical systems development. NeXT will market its software through developers of systems for the health services market.

Montage

Oakland, CA

Montage is a start-up company that has developed an Object Relational Database Management System (ORDBMS) based on Postgres research from the University of California at Berkeley. The Montage database is designed to process images and geographic information. It is ideal as a platform for developing hospital information systems that require the display of medical images, hospital floor plans and database records. Montage plans to sell its software through resellers.

PeopleSoft

Walnut Creek, CA

PeopleSoft is a fast growing vendor of C/S software for human resources and other applications. It enables Windows applications to be rapidly connected to a mainframe. PeopleSoft has had some success in selling its software to hospitals and intends to expand in that market.

A

Appendix: Applications Details

This appendix provides definitions of all the applications identified in this study. The applications are grouped according to categories. Exhibit A-1 includes all applications that are unique to INPUT's definition of the health services industry sector. Exhibit A-2 contains INPUT's cross-industry definitions of applications.

A

Description of Applications

EXHIBIT A-1

Health Services Industry Application Types

Application Category/Type	Description/Examples
Hospital Operations	Perform centralized functions of hospital operation, such as storing patient identification information, patient scheduling, and admission-discharge-transfer functions
Clinical record management	Management of patient's clinical results and records
Patient care, diagnosis	Patient care systems, bedside terminal systems
Patient business information	Information systems to improve decision making at the point of care or in a doctor's office
Service/patient scheduling	Scheduling system for doctors, nurses, facilities, patients, including ANSOS

EXHIBIT A-1 (Cont.)

Application Category/Type	Description/Examples
Medical Departmental	Support the informational needs of individual departments within the hospital (laboratory, pharmacy, radiology, surgery, etc.)
Laboratory Systems	Systems that manage laboratory tests of various types, some are real-time systems
Medical Dictation	Systems that store voice data in a digital form in a computer system. This usually includes speech recognition.
Medical Imaging	Includes CAT Scan, Mammography, MRI scanning systems
Medical Research Support	3-D treatment systems, radio therapy experimental systems
Pharmacy systems	Pharmacy support systems, drug dispensing systems, narcotics dispensing support systems
Radiology information systems	Radiology information
Medical Documentation	Systems for collecting, organizing, storing, and presenting the forms-based information, such as claims forms
Claims processing	Claims forms processing systems
Medical Financial	Systems that support patient billing and medical cost containment
Medical Billing Systems	Patient billing. Medical billing systems that have special features to support the health services market, as opposed to general invoicing that comes with standard accounting packages
Medical Budgeting	Medical cost containment and budgeting systems that are specifically for medical applications, as opposed to general accounting packages

EXHIBIT A-2

Cross-Industry Application Types by Category

Application Category/Type	Description/Examples
Electronic Commerce	
EDI Systems	General-purpose systems to support Electronic Data Interchange
Cross-Industry Financial	
Accounts Payable/Receivable	Traditional systems to handle invoicing and payments and manage receivables
Cost Accounting	Systems to analyze the costs of goods and services
Financial Reporting	Financial systems for the generation of management information
Fixed Assets	Systems to track the book value and depreciation of assets
General Ledger	General ledger
Integrated Financial Systems	Integrated accounting modules with reporting
Other financial	Foreign exchange
General Infrastructure	
Database Conversion - General	Migration to a new database architecture
Database Conversion - Relational/Distributed	Migration to a relational or distributed (or both) architecture
Data Conversion	Projects to convert the date from one database environment to another
Hardware Upgrades	Projects to upgrade or migrate to new hardware
Imaging Systems	Installation of infrastructure to support imaging applications
Operating System Upgrades	Operating system upgrades

EXHIBIT A-2 (Cont.)

Application Category/Type	Description/Examples
General Infrastructure	
Platform Migration - C/S	Projects to upgrade or migrate to new client/server hardware
Platform Migration - General	Projects to upgrade or migrate to new general purpose hardware or networks
Human Resources	
Human resources information system	Human resources information system, HRIS
Payroll	Payroll processing
Office Systems	
Electronic mail and messaging systems	Electronic mail systems
Word Processing Systems	Installation of applications that use word processing
Other	
Computer-aided Instruction	
General Re-engineering	
Network management	
Voicemail	Voicemail systems
Purchasing	
Purchasing	Purchase order processing, management, reporting
Planning and Analysis	
Financial Modeling	Systems to support financial business modeling and analysis
Spreadsheets/Databases	Applications that use desktop spreadsheets and databases

EXHIBIT A-2 (Cont.)

Application Category/Type	Description/Examples
Sales and Marketing	
Marketing Mgt./Support	Sales management, market planning, advertising, etc
Order Entry Tracking	Capture and tracking of orders and fulfillment
Sales Analysis	Statistical analysis of sales performance and trends
Sales Forecasting	Systems to support the projection of future orders
Telemarketing	Applications to support telemarketing operations

B

Appendix: Vendors

This section gives the names and addresses of vendors mentioned in the report.

Vendor Addresses

Vendor	Address
Apple Computer, Inc.	20525 Mariani Avenue Cupertino, CA 95014 Tel: (408) 996-1010
Compaq Computer Corp.	20555 SH 249 MO 040514 Houston, TX 77070 Tel: (713) 370-0670 Fax: (713) 374-1740
CompUSA	See local yellow pages for nearest store
Data General Corp.	4400 Computer Drive Westborough, MA 01580 Tel: (508) 848-5000
Digital Equipment Corporation	146 Main Street Maynard, MA 01754 Tel: (508) 493-5111 Fax: (508) 493-8780
Dell Computer Corp.	9505 Arboretum Blvd. Austin, TX 78759 Tel: (512) 338-4400 Fax: (512) 728-3653
Gateway 2000	610 Gateway Dr. North Sioux City, SD 57049 Tel: (605) 232-2000

Vendor	Address
Hewlett-Packard Co.	3000 Hanover Street Palo Alto, CA 94304 Tel: (415) 857-1501 Fax: (415) 857-5518
IBM	Old Orchard Road Armonk, NY 10504 Tel: (914) 766-1900 Fax: (914) 765-6021
Kurzweil Applied Intelligence	411 Waverley Oaks Road Waltham, MA 02154 Tel: 617-893-5151
Med-E-Mail Corporation	560 White Plains Road, 2nd Floor Tarrytown, NY 10591 Tel: 914-332-6688 Fax: 914-332-6445
MEDITECH	Meditech Circle Westwood, MA 02090 Tel: (617) 821-3000 Fax: (617) 329-9977
Montage Software	1111 Broadway, Suite 2000 Oakland, CA 94607 Tel: (510) 652-8000 Fax: (510) 869-6388
NCR Corp.	1700 S. Patterson Boulevard Dayton, OH 45479 Tel: (513) 445-5000 Fax: (513) 445-4184
NeXT Computer	900 Chesapeake Drive Redwood City, CA 94063 Tel: 415-366-0900 Fax: 415-780-3914
PeopleSoft, Inc.	1331 N. California Boulevard, Suite 400 Walnut Creek, CA 94596 Tel: (510) 946-9460 Fax: (510) 946-9461

Vendor	Address
Shared Medical Systems Corp.	51 Valley Stream Parkway Malvern, PA 19355 Tel: (610) 219-6300 Fax: (610) 219-3124
Sun Microsystems, Inc.	2550 Garcia Avenue Mountain View, CA 94043 Tel: (415) 960-1300 Fax: (415) 969-9131



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Client/Server Applications Trends

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Applications Program**

***Client/Server Applications Trends—
State and Local Government***

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I

Introduction

This report analyzes trends in client/server (C/S) applications in the state and local government market segment. It is the seventh in a series of vertical market reports produced as part of INPUT's Client/Server Markets and Applications subscription service.

A

Objectives

Based on a user survey, this report addresses the following issues regarding the state and local government sector:

- To what degree are state and local governments migrating to client/server architecture?
- Which applications are likely to be targeted for implementation over the next two years, and which are headed for a downsized client/server environment?
- Who is managing implementation or conversion of client/server applications: Central information systems (IS) function, local IS function, user management or third-parties?
- To what degree are industry participants looking to outside vendors for products and services?

B

Scope

The analysis focuses on the state and local government industry sector within the United States. This particular study surveys 130 different organizations. About 55% of the organizations are state governments and the remaining 45% are local governments.

Exhibit I-1 shows the breakdown of organizations interviewed by type of organization.

EXHIBIT I-1**State and Local Government Respondents**

Description	Number of Different Organizations	Percentage of Organizations (%)
State Governments	72	55
County Governments	10	8
Cities	48	37

C**Methodology**

Data for this analysis is taken from INPUT's applications database, built from telephone interviews throughout 1993.

Respondents identified 170 applications or projects they would be implementing over the next two years using their own terminology, rather than using a predetermined set of definitions. Once the survey was completed, INPUT analyzed the project descriptions and coded them into 13 application categories.

Exhibit I-2 lists the applications in each category. Detailed descriptions of each application type are contained in Appendix A.

The sample size is relatively small compared with the size of the market. Graphs and charts are provided to supplement intuition rather than a statistically rigorous market analysis that would have required more interviews.

EXHIBIT I-2

Definition of State and Local Government Application Categories

Application Category	Application Type
Engineering	Engineering drawings, mapping, geographic information systems
Hospital Operations	Clinical records management
Justice	Computer-aided dispatch, police record management, crime analysis, jail operations
Public Administration	Animal control, building permits, library systems, land parcel database, business license
Public Finance	Appraisal, real property tax, tax management, fiscal management, fund accounting, tax collection
Planning and Analysis	Forecasting, project management, spreadsheets
Purchasing	Purchase orders, encumbrance control
Other	Other
Cross-Industry Applications	
Human Resources	Applicant tracking, benefits administration, labor/job scheduling, management development, payroll, time and attendance
Infrastructure	Hardware, software & network upgrades
Office Systems (includes 3 spreadsheet applications normally included under Planning & Analysis)	Electronic mail & messaging, desktop publishing, integrated office systems, spreadsheets, word processing
Telecommunications	Voice mail, voice response systems

In addition to the survey, additional interviews were undertaken to provide information for the case studies in Chapter V. These discuss current user perspectives on C/S systems.

D**Characteristics of the Sample****1. Sample Demographics**

EXHIBIT I-3

**State and Local Government Respondents
by Geographic Location**

Location	Number of Different Organizations	Percentage of Organizations (%)
East	61	47
Central	37	28
West	32	25

2. Characteristics of Survey Respondents

User managers, with direct responsibility for line or staff operations in a functional area other than information systems (IS), responded to the questionnaire in Appendix B. Respondents frequently included the IS organization. Consequently, respondents, whose distribution is shown in Exhibit I-4, include:

- *Line Manager*—A manager/executive responsible for line operations at a government department, division or branch level; e.g., director of elections, director of finance, chief of police, etc.
- *Staff Manager*—A manager/executive in charge of staff operations at a government department, division or branch level; e.g., director of human resources, director of purchasing, etc.
- *IS Manager*—A manager/executive whose primary responsibility is the management of information systems activities, whether for a number of government departments, or a single department.

EXHIBIT I-4**Job Classification of Respondents in State and Local Government**

Job Classification	Proportion of Respondents (%)
Line Manager	14
Staff Manager	50
IS Manager	36

Staff managers represent the following functions:

- Office Administration
- Business Management
- Human Resources
- Compensation Management
- Accounting
- Police Records Administration
- Library Administration
- Public Information
- Purchasing
- State Courts Administration

E**Organization**

The remainder of the report is organized into five chapters:

- Chapter II, Executive Overview, summarizes the findings of this study and provides recommendations for vendors and purchasers of C/S systems.
- Chapter III, Applications Analysis, discusses the key applications that will undergo conversion or reimplementation by state and local governments over the next three years. It addresses:

- Trends in state and local government applications
 - Leading issues
 - Analysis of the applications by application category
 - Where client/server systems are being installed
 - Target platforms and platform combinations
 - Anticipated changes in the system environment
- Chapter IV, Management and Budgets, analyzes who will manage the projects and the size of their budgets. It discusses:
 - Project management and control strategy
 - Outside resources
 - Near-term expenditures for applications development
 - Growth rates for budgets
 - Chapter V, State & Local Government Application Case Studies, describes client/server applications.
 - Chapter VI, Vendor Analysis, reviews respondents' comments on leading vendors.

F

Related Reports

INPUT has published other reports on the state and local government market and on client/server applications that complement this report:

- *Market Analysis Program, State and Local Government, 1993-1998*
- *Client/Server Market Analysis, 1993-1998*
- *Client/Server Applications Trends Reports* (There are nine). Other reports focus on discrete manufacturing, process manufacturing, insurance, health services, retail trade, utilities and telecommunications.

II

Executive Overview

This chapter summarizes the key findings in the report.

- Section A provides a brief overview of the C/S opportunity.
- Section B discusses the key findings and answers the questions given at the start of the report.
- Section C provides key statistics on client/server trends in state and local government.
- Section D makes recommendations for vendors who are interested in this sector.

A

Background

State and local governments are caught in a squeeze. On the one hand, there are tremendous pressures to increase spending. An aging population is demanding increased health and public safety services, a weak economy increases social welfare costs, and inflation, though at its lowest levels in years, drives up the cost of the wages, as well as goods and services needed to operate government.

On the other hand, state and local governments' revenues are flat at best, and in many cases have decreased significantly, as a weak economy has eroded sales and income taxes. In better times, governments could watch revenues grow as incomes and sales increased, or failing that, they could simply increase taxes. Those days, however, have passed.

Several state and local government executives feel that this pressure to become more efficient is good and will force a restructuring of government at all levels, including the state and

local level. Most government executives see the increased use of technology as the only way they can reduce costs, provide additional services to the public and improve the productivity of government workers.

There have been some large and well-publicized successes involving client/server systems in the state of Michigan and in Merced County, California. In both cases, major welfare applications were developed to improve service to recipients, increase the productivity of case workers and reduce fraud. Welfare claims administration is a very complex process. One estimate is that more than 100 federal, state and local forms must be completed for a typical case, and most of the information is redundant. Both these systems assist claimants and case workers to determine which of the myriad of programs apply to a particular case.

B

Key Findings

While the demand for new systems should encourage information technology suppliers, state and local governments tend to be late adopters, rather than innovators, of new technology. Despite this, they are migrating to client/server systems at only a slightly slower pace than other industries.

Procurement cycles in the state and local government market tend to be very long—on the order of one to two years. However, few planned C/S projects in this sector are more than \$1 million, and so will likely be at the shorter end of this time period. These long cycles are due to the government procurement process which is often very formal, involving detailed requests for proposals (RFPs), and lengthy evaluations. The rules vary considerably from state-to-state. Local governments may bypass this process under some circumstances (in California, for example), but in many other states virtually every procurement is formal. Vendors considering entry into this market should expect to invest for a long time before seeing any return.

Though application software vendors and suppliers of turnkey systems, who specialize in this sector, are themselves migrating their offerings to client/server architecture, relatively few such applications are available now. Contrast this with cross-industry financial and human resource applications, or insurance

applications, where the leading vendors have client/server systems on the market.

Major IS issues will be substantially the same over the next several years. Funding will remain a significant problem, and IS managers' top priority for new development will be responding to legislated requirements. Given budget pressures, they will have a very limited capability to execute comprehensive technology plans.

C

Key Statistics

- Thirty-two percent (32%) of state and local governments surveyed have adopted a strategy of moving to C/S, compared with 33% to 38% in other industries.
- Mainframes continue to be a much larger part of the picture in state and local government when compared with other industries. Almost half of all planned IS projects will include a mainframe, either alone or with other components. Fifteen percent (15%) of the client/server projects will include a mainframe.
- Users will implement 64% of new applications and 77% of client/server applications identified in this sector. This is about twice the corresponding rate in manufacturing.

Managers in this sector generally perceive client/server systems as less expensive to implement and easier to use than host-based systems. The greatest demand for new systems will be for:

- New infrastructure, as state and local governments try to replace antiquated systems.
- Justice systems, only 18% of which are planned as client/server systems at the present time.
- Financial systems, which rank fourth in terms of frequency of planned applications, and 35% of which will use C/S.
- Office systems, electronic mail systems in particular, are strong candidates for client/server implementation. Penetration of C/S systems in office applications is only 25% in this sector.

D**Conclusions and Recommendations**

Application software vendors and suppliers of turnkey systems, among the first to move their offerings to a client/server architecture, will enjoy a competitive advantage in at least one-third of the opportunities in this sector.

The length of the procurement process presents challenges and opportunities for vendors. On the one hand, it allows ample time to identify opportunities, to influence project specifications and develop alliances with other vendors. On the other hand, the process is costly, demanding careful selection of opportunities.

Many vendors have invested significant amounts of time and money in developing a prospect, only to have the legislative body postpone the project or cancel it altogether. Given current budget pressures, vendors should be careful to select projects which either show rapid pay-back to the agency, or have a high political priority. Projects that pass one or both of these tests have a much higher likelihood of proceeding all the way through the procurement cycle.

Systems integrators, interested in entering the state and local government market, are advised to develop alliances with the smaller, specialized firms already in the market. Combining the larger firm's financial strength and skills on very large projects, with the smaller firm's experience and market knowledge, will make a formidable competitive entry on very large projects.

Training and support is a consistent theme in interviews with the user. IS management, and increasingly vendors, must plan to adequately train and support users. Vendors interested in this sector should explore user training and support service offerings that build relationships while providing cost-effective training and support.

III

Applications Analysis

This chapter analyzes state and local government applications in detail. It contrasts C/S applications with non-C/S applications.

- Section A discusses leading trends in state and local government that affect the implementation of C/S systems.
- Section B discusses leading IS issues as reported by respondents.
- Section C discusses C/S applications. It estimates the percentage of new systems that will be implemented using a C/S architecture and describes opportunities for C/S applications.
- Section D discusses target platforms, i.e., mainframe, minicomputer or LAN.
- Section E shows how the systems environment is changing.
- Section F examines the differences in client/server plans at the city, county and state levels.

A

State and Local Government Applications Trends

The following key trends will shape state and local government IT development and implementation in the next few years:

- Budget pressures will continue to be a major concern for users and vendors. For vendors, the situation is not dissimilar to that in the private sector where many companies have delayed funding new projects due to lack of capital. The result has been an increasing focus on shorter and less-costly projects that have a demonstrable short-term pay back.

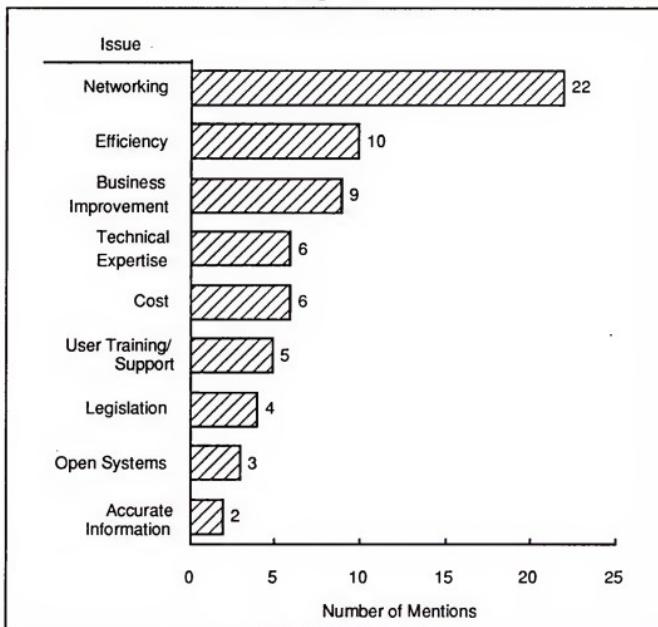
- The need for short-term pay back can be a critical factor. Projects that provide a clearly identifiable, early return may frequently receive funding where other, longer-term projects may not. Vendors are forming partnerships with government entities to develop new cost-saving applications they will be able to sell elsewhere.
- Though the growth of LANs and client/server systems is expected to continue, large mainframe systems will still be needed to support the large databases at the state level, in particular.
- Connectivity and interoperability continues to be a major issue in state and local government. Such projects are intended to improve efficiency of government workers by reducing or eliminating redundant information and effort.
- Public access to information and the ability to disseminate services electronically, continues to grow rapidly in state and local governments. The system developed by Andersen Consulting for Merced County, California represents a trend in state and local government that is becoming more widespread. The Merced system provides direct interaction with the public through on-line terminals to request information and request and receive benefits.

B

Leading IS Issues And User Concerns**1. Ranking of Leading IS Issues**

When asked to identify the major issues relevant to IS in the next two years, 101 respondents gave free-form answers that were coded by INPUT. Some respondents gave multiple answers and others gave none, resulting in 113 responses. Responses given more than once are tabulated in Exhibit III-1.

EXHIBIT III-1

Leading IS Issues

113 Responses from 101 Organizations

2. Discussion Of Issues

Key issues shown in Exhibit III-1 are discussed in detail below.

- *Networking*—Issues surrounding local- and wide-area networks and connectivity with other government agencies dominate the IS agenda in state and local government.
- *Efficiency*—Governments are having to do more with less, and many user and IS executives alike see IS as the only way they can provide more services to the public for less money.

- *Business improvement*—Systems that allow the public to access government information, directly from a terminal without talking to a clerk, received numerous mentions.
- *User training and support*—Both user and IS executives recognize that investment in new technology will be wasted unless government workers are trained in its use. Five organizations feel this is the single most important issue in the implementation of planned systems. Users are looking to vendors to supply the required user training and support.
- *Cost of new systems, budgets*—Budgets are tight, and are likely to remain so in the foreseeable future. Projects with uncertain paybacks are slow to receive funding.
- *Migration to open systems*—Three respondents cited migration to open systems as the major issue in their plans for new applications.
- *Technical expertise*—The lack of technical expertise within the organization was viewed by some as a major issue. These users are looking to vendors to provide that expertise before, during and after implementation of new applications.
- *Legislative mandate*—Priorities for applications are often set by new requirements dictated by the legislature. Two of the respondents mentioned the new "motor voter" bill, enabling people to register to vote when applying for a driver's license, or notifying the DMV of a change in address. It is significant that nobody had planned to implement such applications 12 months earlier, and that tight budgets may have forced delays on other projects long in the planning.
- *Improved accuracy of information*—Improving the accuracy of information is a major issue in voter registration systems, as well as health and welfare applications. These new applications were aimed at eliminating redundant ID numbers for claimants and sharing data between systems in separate agencies.

C

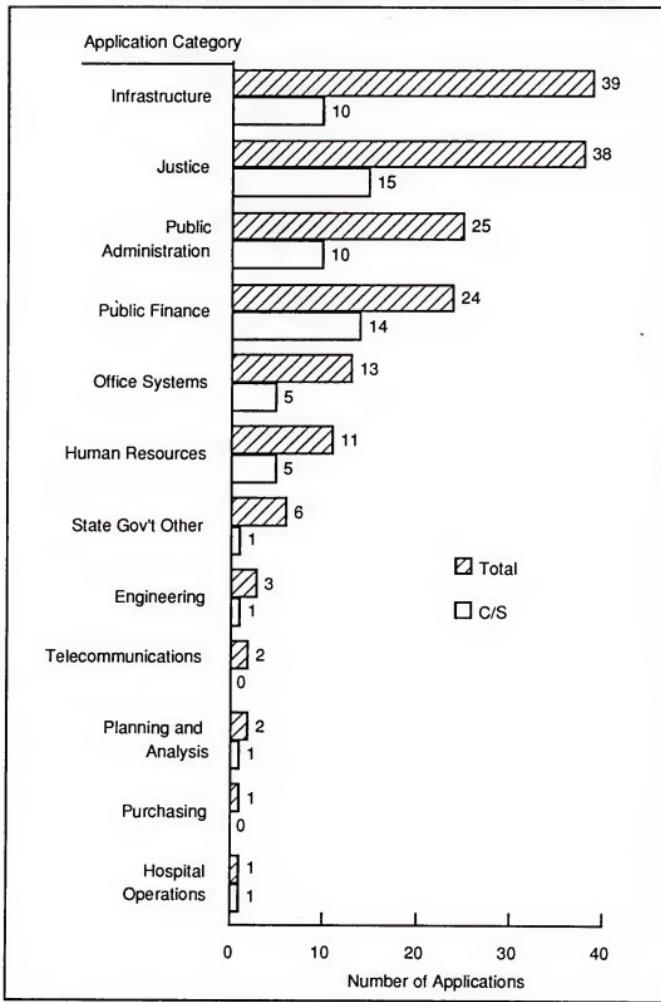
Client/Server Applications

1. Client/Server Penetration by Application Category

C/S systems will achieve a 25% penetration rate in state and local governments over the next few years. Respondents were asked if they were using, or planning to use, client/server systems. Exhibit III-2 shows the number of applications surveyed in each of the applications categories given in Exhibit I-2. It also shows the number of those for which the respondent indicated the C/S will be a major strategy.

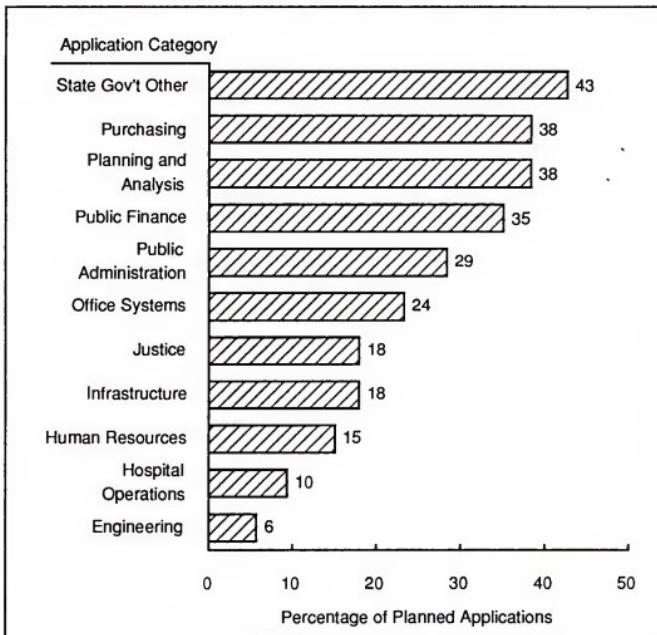
EXHIBIT III-2

Planned Application Changes and Use of C/S by Category



165 Applications; 107 Respondents

Exhibit III-3 takes the same data as Exhibit III-2 and expresses C/S penetration as a percentage of systems installed for each application category. The application categories are then ranked according to the percentage of systems migrating to C/S architecture.

EXHIBIT III-3**Use of C/S by Application Categories**

Each category in the chart is explained in detail, suggesting opportunities for system vendors.

State and local governments plan to invest heavily in updating and upgrading their *infrastructure*, often characterized by antiquated systems. However, budget pressures make it difficult to replace applications, so investment is being directed at extending the life of those systems and networking existing

systems, rather than replace them with new applications based on client/server architecture.

Justice systems are among the leading new applications planned, but only 18% will be client/server. This is because there are few client/server systems in that market presently available from vendors. Few users have the time or the funds to develop these applications. Vendors who can demonstrate the advantages of a client/server approach should be well positioned.

Financial systems in state and local government, represent one of the hottest application areas for vendors of client/server systems. This application area ranks fourth in terms of frequency of planned applications, and 35% of the systems will use C/S.

Office systems, in particular electronic mail systems, are strong candidates for client/server implementation. Typically, office systems rank high in many other vertical markets surveyed by INPUT. However the penetration of C/S systems (25%) is lower than the corresponding 73% penetration in the health services market where client/server systems are more prevalent.

Exhibit III-4 gives a detailed breakdown of the data collected. It shows for each category the number of applications surveyed in the category, the strategy, the main platforms and major resources used.

EXHIBIT III-4

Application Categories

Application Category	No. of Applications	Strategy		Platform			Resources				Utilizing EDI	Out-srd	
		Client /Srvr	Down sizing	CS/ LAN	Minicomptr	Mainframe	Cent. IS	Dept. IS	User Staff	Syst. Integ.	Other Outside Svcs.		
All Applications													
Engineering	3	1	0	1	0	0	0	0	2	0	2	2	0
Hospital Operations	1	1	1	1	0	1	0	0	1	0	1	1	0
Human Resources	11	5	4	4	2	7	2	4	5	2	4	10	4
Infrastructure	39	10	12	15	6	20	7	14	19	11	13	22	18
Justice	38	15	17	17	10	10	15	15	32	5	26	23	15
Office Systems	13	5	3	3	2	7	6	4	6	4	4	7	5
Public Administration	25	10	4	10	2	10	3	7	14	11	13	14	7
Public Finance	24	14	2	14	3	17	13	7	19	5	3	8	15
Planning and Analysis	2	1	0	1	0	0	0	0	1	1	2	0	0
Purchasing	1	0	0	1	0	0	0	0	0	0	0	1	0
State and Local Other	5	3	1	2	0	4	3	3	4	1	0	2	2
State Gov't Other	6	1	0	1	0	5	2	3	4	5	3	4	1
Telecommunications	2	0	0	0	0	2	0	2	2	0	0	2	2
Total—All Applications	170	66	44	70	25	83	51	59	109	45	71	98	75
Client/Server Applications													
Engineering	1	1	0	0	0	0	0	0	0	0	1	1	0
Hospital Operations	1	1	1	1	0	1	0	0	1	0	1	1	0
Human Resources	5	5	1	3	1	2	2	2	2	2	4	5	3
Infrastructure	10	10	3	6	0	7	3	3	6	6	2	5	4
Justice	15	15	13	9	1	5	5	5	12	2	9	7	0
Office Systems	5	5	2	1	0	2	3	0	3	2	1	4	2
Public Administration	10	10	2	6	0	5	1	2	9	6	6	8	3
Public Finance	14	14	1	11	1	10	9	2	14	1	3	5	12
Planning and Analysis	1	1	0	0	0	0	0	0	1	0	1	0	0
Purchasing	3	3	1	2	0	3	2	3	3	0	0	2	0
State and Local Other	1	1	0	1	0	1	0	0	1	0	0	1	1
Total—C/S Applications	66	66	24	40	3	36	25	17	51	20	28	39	35
Comparison of C/S Applications with Other Applications													
Percentage for all applications (%)	%	39	26	41	15	49	30	35	64	26	42	58	44
Percentage for C/S applications (%)	%	100	36	61	5	55	38	26	77	30	42	59	53

An explanation of the column headings follows:

- “Number of Applications” is the total number of applications for each of the application categories.
- The “Strategy” heading contains two subheadings, “Client/Server” and “Downsizing.” The “Client/Server” count, by category, indicates the number of applications within the category being implemented using a C/S architecture. The count under the heading “Downsizing” represents the number of client/server applications, out of the total, being implemented as part of a general downsizing strategy.
- The “Platform” heading indicates the number of times one of the three major platform classes was mentioned as the key implementation platform.
- The “Resources” heading covers six sources of potential resources that will be employed as part of the implementation process. As was the case with the question regarding platform, more than one response per application was permitted.
- Finally, for each application, respondents were asked to indicate whether the application would use EDI or be outsourced. The last two columns give a tabulation of those responses.

An explanation of the rows follows:

- The first set of rows represents the leading application categories.
- The “TOTAL—All applications” row adds up the rows describing the application categories.
- The above rows are repeated for applications where the respondent indicated there was a major strategy to move to C/S systems.
- The next to the last row takes the “TOTAL—All applications” and divides each column total by the number of applications to get a percentage. The final row calculates a similar percentage for C/S applications so they may be compared with the population as a whole.

2. Observations on the Sample Mix

In analyzing the C/S applications in the above table, organizations planning client/server applications are more likely to be downsizing and employing user staff as a resource:

- Thirty-six percent (36%) of those surveyed who were downsizing planned to implement a client/server application, versus 19% of those who were not.
- Seventy-seven percent (77%) of those planning client/server applications reported they intended to employ user staff as a resource, versus 56% of those who did not.

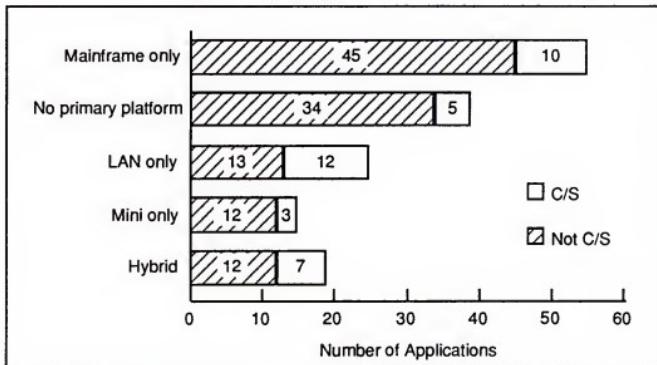
D

Target Platforms

Exhibit III-5 shows the target platforms for the 170 applications in the sample where platform information was available. Users were asked to identify their primary application platform for applications undergoing major changes.

EXHIBIT III-5

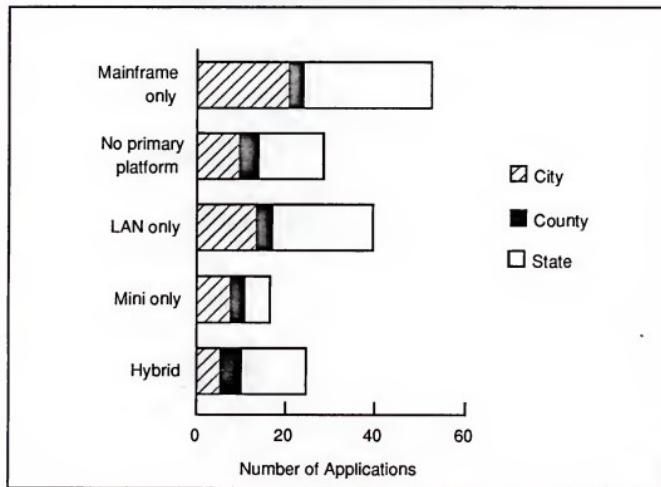
Target Platforms for Planned Applications



Overall, there is still a strong reliance on mainframes, with 49% of applications using a mainframe either alone or with other components.

EXHIBIT III-6

Target Platforms for Planned Applications



E

Anticipated Changes in the Systems Environment

Respondents provided information on specific changes in their systems environment over the next two years. Responses fell into three categories.

1. Upgrades

Sixty-two percent (62%) anticipate that they will be upgrading their systems over the next two years. Of those who want to upgrade, slightly more than 38% are moving to client/server systems.

2. Increased Standardization

Movement toward increasing standardization in platforms and operating environments was predicted by 44% of the respondents. This is much lower than in some other industries.

3. Migration to C/S

A relatively low proportion of state and local government respondents (32%) are adopting C/S migration strategies, compared with 33% to 38% in other industries.

4. Downsizing

Twenty-six percent (26%) of applications are being downsized. This is comparable to other industries.

F

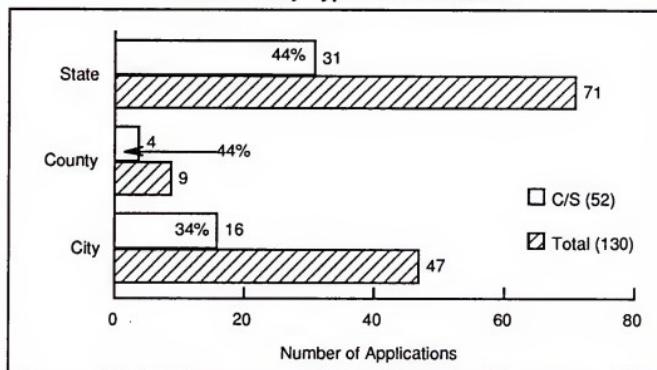
Client/Server Implementation By Type Of Government

Of the 130 organizations interviewed, 40% indicated that they were moving toward a C/S strategy.

Exhibit III-7 below shows that cities are slightly behind counties and states in plans for C/S applications.

EXHIBIT III-7

Use of C/S by Type of Government



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IV

Management And Budgets

This chapter discusses applications management and budgeting. The chapter is organized as follows:

- Section A provides an analysis of the role user management and IS departments play in project management of applications.
- Section B analyzes resources that will be used to implement applications—the emphasis being on development rather than overall project management.
- Section C analyzes expenditure plans; that is, estimated budget sizes for investment in new systems.
- Section D analyzes budget growth rates; that is, the amount respondents expect their budgets to grow annually over the next two years.
- Section E identifies key opportunities by application category, spending growth rate and size of budget.

A

Project Management

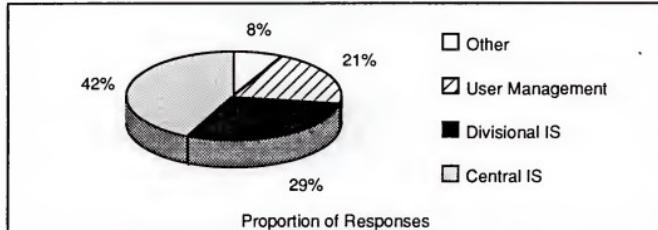
INPUT asked respondents to identify who was managing each planned application project.

- Twenty-one percent (21%) of the respondents' applications will be managed by user management. This is significantly lower than the 40% found in banking and finance.
- Central IS will manage 42% of the projects. Divisional IS will manage another 29%, placing the IS groups firmly in charge of implementation in state and local government.

- Eight percent (8%) of the respondents said that other parties would manage new projects, most of whom referred to a committee of users and IS personnel.

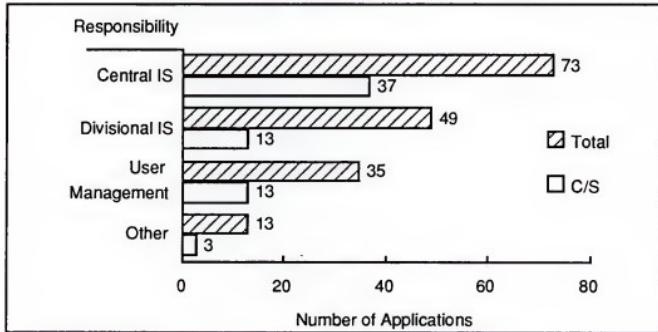
Of 170 applications, 66 of them are moving, or have already migrated, to client/server solutions. Exhibit IV-1 graphically shows the project management responsibilities, as a percentage, for all applications. Exhibit IV-2 shows the number of applications managed by each organization for the entire application set and just client/server applications.

EXHIBIT IV-1

Project Management for Applications

170 Respondents

EXHIBIT IV-2

Primary Project Management Responsibility

170 Applications

EXHIBIT IV-3

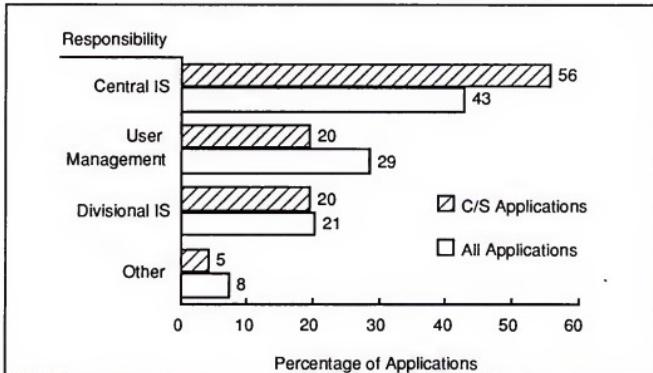
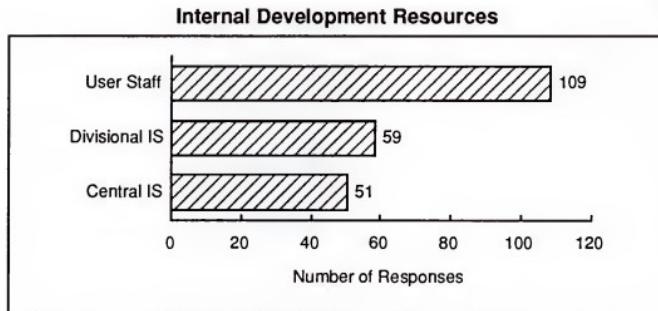
Primary Project Management Responsibility**B****Implementation Strategy****1. Sources of Development Resources**

Exhibit IV-4 shows the resources required to implement the 170 applications. While project management comes from either the central or departmental IS groups, most of the implementation resources will come from the users themselves.

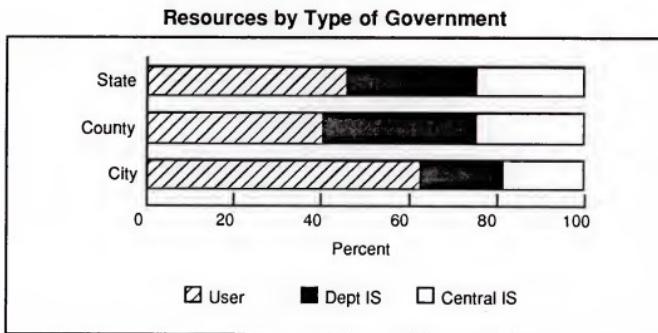
EXHIBIT IV-4



For almost 64% of the projects' user line or staff, management will assume direct implementation responsibility. This is close to double the corresponding average for the manufacturing industry sectors.

As shown in Exhibit IV-5, user personnel in cities will implement new applications to a far greater extent than their counterparts in counties or states. This is likely due to the fact that cities have smaller IS staffs.

EXHIBIT IV-5

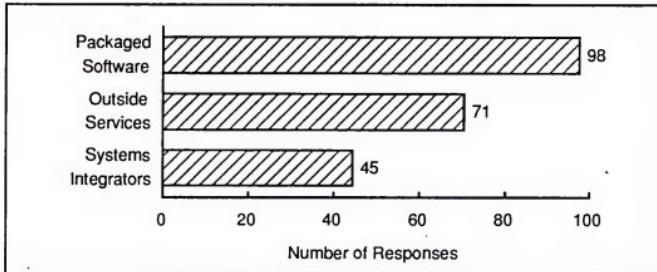


2. Use of Software Products and External Resources

As shown in Exhibit IV-6, more than 58% of the implementations planned for the next two years will use software packages.

EXHIBIT IV-6

Use of Outside Products and Services

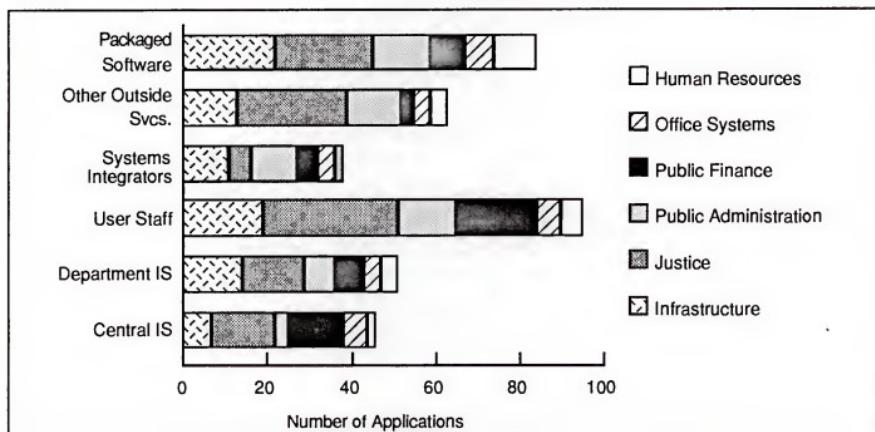


3. Resource Use By Application Category

Exhibit IV-7 takes the major application groupings in the state and local government market and identifies resources used to implement them.

EXHIBIT IV-7

Resource Use by Application Category



As can be seen, the number of times a particular resource was mentioned for each major application grouping is tabulated. The height of each column measures the number of mentions of a resource, and clearly central IS is the most frequently used.

Software packages are most frequently used for human resources and spreadsheet applications. Most client/server office systems and public administration systems also use packaged software.

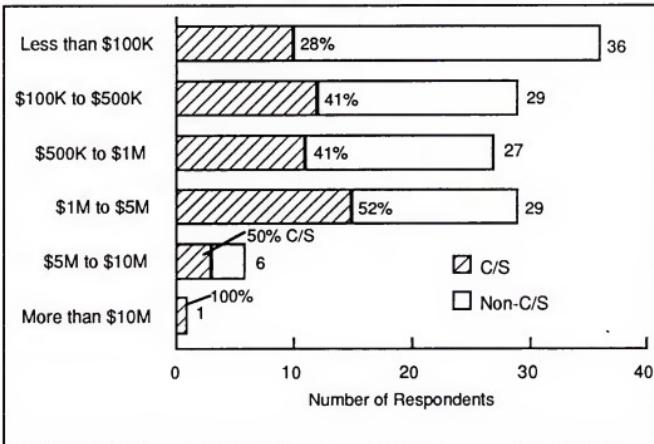
C

Expenditure Plans

Exhibit IV-8 shows the anticipated amount each respondent expects to spend on applications changes in 1994. The spending amounts are plotted against the number of mentions. The shading differentiates between respondents that mentioned C/S as a key strategy and those who did not, marked non-C/S. As can be seen, more than 50% of the systems at the top end of the range are expected to be client/server.

EXHIBIT IV-8

Expected IS Spending in 1994

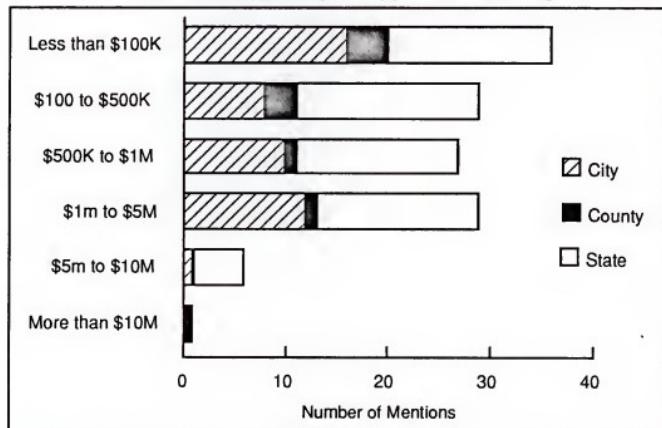


Budgets for new projects in state and local government are small when compared with other industries. Twenty-eight percent (28%) of the state and local government organizations surveyed expect to spend \$1 million or more. The corresponding proportion in the insurance industry and the manufacturing sectors are 60% and 43% respectively.

Exhibit IV-9 also shows expected IS spending, but differentiates by type of government.

EXHIBIT IV-9

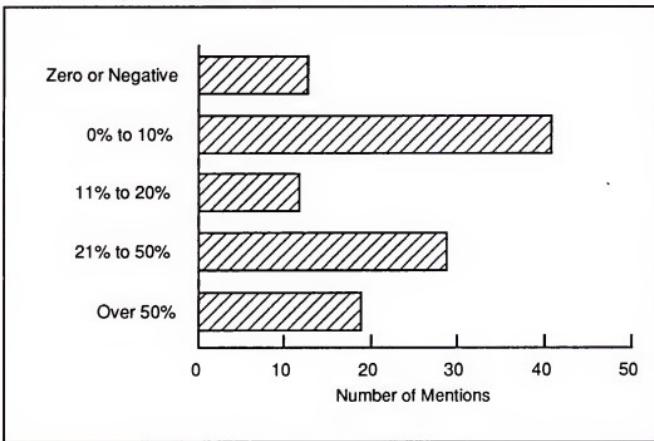
1994 Planned Spending on Applications Changes

**D****Budget Growth Rate**

Respondents were asked to identify how much their IS budget would grow annually over the next few years. They were asked for the expected growth in their IS budget, excluding hardware, for applications only. Spending rates for applications improvements and IS overall (this includes personnel costs, equipment upgrades and support) are above industry norms. On average, total IS and applications development spending are expected to grow at an annual rate of 28% versus 5% to 9% in other industries.

This high rate of growth is reasonable in view of the smaller projects planned in state and local government.

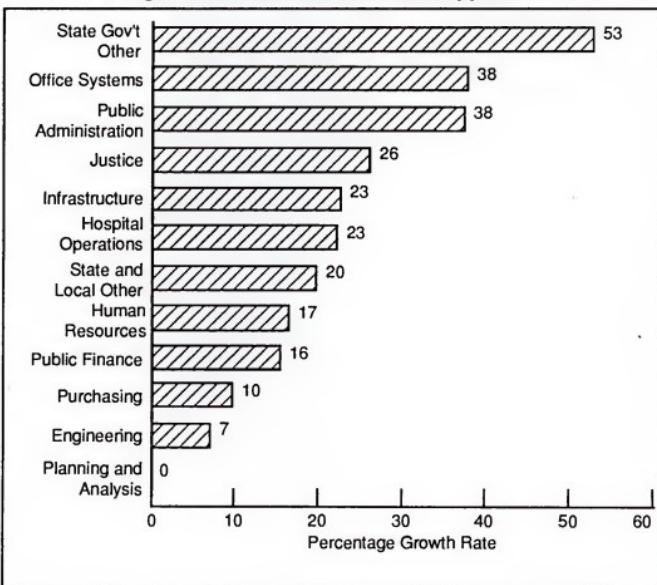
Exhibit IV-10 shows the distribution of application budget growth rates.

EXHIBIT IV-10**Annual Spending Growth Rates for Applications Development**

Total Responses: 114

Examining the data in more detail, the applications being implemented where the budgets are growing the fastest are shown in Exhibit IV-11.

EXHIBIT IV-11

Budget Growth Rates for Selected Applications

All the applications included in "State Government Other" are related to health care systems: Medicaid tracking, Medicaid management information systems and family health systems.

E**Key Opportunities**

Respondents were asked to give a range for the amount invested in applications, excluding hardware. From these figures, approximate average investments were calculated by taking the lower limit of the budget range. For example, if the budget were \$500 thousand to \$1 million, then \$500 thousand was chosen.

For each respondent, a key application was selected. For this application, the opportunity was ranked as high growth if the average growth rate was more than 30%, medium growth if it was

from 15% to 30% and slow growth if it was less than 15%. Opportunities were identified as large if the budget average was \$1 million or more, and small if the budget average was under that figure. This resulted in Exhibit IV-12 for the application categories.

EXHIBIT IV-12

Key Opportunities in State and Local Government

	High Growth More than 30%	Medium Growth 15%-30%	Low Growth Less than 15%
Large Budget \$1 million and more	Office Systems Public Admin. State Gov't Other	Hospital Operations Human Resources Infrastructure Justice Public Finance	Engineering
Small Budget Less than \$1 million	Office Systems Public Admin.	Human Resources Infrastructure Justice Public Finance	Engineering Planning/Analysis Purchasing State/Local Other

Note that small as well as large projects are planned for the following applications categories: office systems, public administration, human resources, infrastructure, justice, public finance and engineering.

The survey suggests the greatest opportunities are in the following applications:

- Office systems, especially electronic filing systems
- Public administration, including property tax systems, withholding tax systems and electronic funds transfer applications
- Other state government applications, especially health care systems, and Medicaid information systems

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V

State And Local Government Application Case Studies

This chapter presents case studies based on interviews with three state and local government organizations that have recently implemented client/server applications.

INPUT interviewed professionals at the following organizations:

- Department of Social Services, Montgomery County, Maryland
- Department of Fish & Game, State of Alaska
- Department of Health and Social Services, State of Delaware

A

Department of Social Services, Montgomery County, Maryland

1. Application Description

Child Welfare Case Management System—tracks child welfare cases from initial report through to final disposition.

2. Reasons for Implementation

Each month, Montgomery County's Department of Social Services receives more than 200 reports of suspected child abuse or neglect from teachers, doctors or neighbors. Social workers screen these reports and refer about 75% to case workers for further investigation.

The case workers had a paperwork nightmare. They were constantly taking information from the mainframe and Manila folders to prepare court cases. The goal was to build a system to manage information from the point of initial screening through to investigation, assessment and treatment.

3. Vendors Selected and Alternatives Considered

System platforms

Server: IBM PS/2 model 95

Clients: IBM PS/2 model 56

Network: Novell NetWare

Software: Microsoft Windows, SQLBase Server, SQLWindows

Applications Software

Developed in-house by Information Systems Department

Systems Integrators

None

Other Support Organizations, e.g., Processing Services

A professional services firm supplied one part-time person to the development project.

Alternative Architectures Considered

Initially, the IS Department planned to implement the application on an IBM mainframe with DB2. IBM offered significant support to develop the application, with the intention of offering it to other welfare agencies throughout the country.

As part of the design effort, the development team built a prototype so users could see the screens before the system was built. From the prototype, it became apparent users would not have the flexibility to jump from one screen to another when taking information over the telephone. The users and IS decided that the application demanded a graphical user interface to facilitate navigating through the system efficiently. Development was restarted with a client/server architecture.

User Benefits

The users have all the information related to a case in a single place. They are able to cut and paste information into word processing documents.

Administrative Benefits

Case workers are able to handle an increasing workload more quickly and efficiently.

Program Development Benefits

The experience gained on the project underscored the differences in design philosophy between client/server and host-based applications. In the end, the original mainframe design had to be replaced entirely with a new design for the client/server environment.

4. System Costs

Ignoring the false start on the mainframe version, the first version, based largely on the original mainframe design, was ready in three months. It became apparent, however, that this design was inefficient in the client/server environment. The application was then rewritten to maximize performance in this environment. This second effort required six months. The team consisted of one full-time IS employee and one part-time contractor for the total nine-month period.

5. Summary

All social workers now use the new system, and would not think of picking up a pencil and paper unless the system was unavailable for some reason.

B

Department of Fish & Game, State of Alaska**1. Application Description**

Information Tracking Systems—Assists managers in the Commercial Fisheries Division to track fish processing, expenditures and personnel.

2. Reasons for Implementation

The Commercial Fisheries Division has 200 users who previously used an IBM 3090 for fishery processor tracking, expenditure control and personnel. The mainframe system, however, was difficult to adapt to changing requirements. If, for example, a user wanted to add a new field to a table in order to monitor a

particular species of fish, that person would have to make a formal request to a database administrator, then wait for the change to be made before any new information could be entered. Sometimes, the user found the requested change did not meet requirements, so another request was submitted.

Users analyzing data in the mainframe database often had to print the data—one screen at a time, manually sort through dozens of pages to select data, then rekey it into a spreadsheet program on a PC.

The division decided to move to a client/server environment to give users more control over their data to make applications more easily adaptable to changing requirements, improve operational efficiency and reduce costs.

3. Vendors Selected and Alternatives Considered

System platforms

Host: IBM 3090, DB2

Server: 33 MHz 486

Clients: 386, 486 computers

Network: Novell NetWare

Software: Microsoft Windows, SQLBase Server, SQLWindows

Applications Software

Developed in-house by the division's computer services staff

Systems Integrators

None

Other Support Organizations, e.g., Processing Services

None

Alternative Architectures Considered

Client/server was the only architecture considered as an alternative to the existing mainframe applications. Various vendors were considered for database and applications development tools, including Oracle, Gupta and Sybase. Software price was a major consideration in selecting a vendor.

User Benefits

Users now can add data elements to the database without outside help. In addition, they can easily export data to other applications for further processing. Errors in accounting data, sent to the state's mainframe for processing, have been virtually eliminated, thereby saving clerical time in correcting input batches rejected by the mainframe.

Administrative benefits

Users are in control of their own data and applications. The rules, procedures and support staff associated with a centralized computing facility, serving different departments, have been reduced significantly or eliminated altogether.

4. System Costs

Project costs have not been computed. The applications development cost, when measured in terms of person-months, was about the same as the development of host-based applications. The cost of commercially available client/server software was a fraction of the cost of corresponding software for the mainframe.

5. Summary

Users are very happy with the new client/server applications. The expenditure control and personnel applications have been adopted by other divisions within the Department of Fish and Game, and are being considered by other departments in the state government.

C

Health and Social Services, State Of Delaware**1. Application Description**

Long-Term Care Management System—assists case workers to administer long-term home health care for the elderly.

2. Reasons for Implementation

The Department of Health and Social Services (DHSS) serves elderly clients who live alone, want to stay out of nursing homes, but require some assistance to maintain their independence in the community. When clients request service from DHSS, their

names are entered into the Long-Term Care Management System (LTCM) which refers cases to the appropriate workers, depending on skills, location and current caseload. The LTCM system maintains a file on each client's assessment, problems and a history of services, and prepares all the necessary reports.

Prior to implementing the system, all information was recorded in paper files. As the caseload grew, retrieval of records became increasingly difficult and reports became less reliable.

3. Vendors Selected and Alternatives Considered

System platforms

Host: IBM 3084, DB2

Server: 33 MHz Gateway 2000

Clients: 20 and 25 MHz 386 PCs

Applications Software

Developed in-house by DHSS staff

Systems Integrators

None

Other Support Organizations, e.g., Processing Services

None

Alternative Architectures Considered

Despite the fact that most of the DHSS programmers on the project had a mainframe background, they decided they could develop the application faster in a client/server environment than on the mainframe. Furthermore, they believed that Windows offered a better user interface for the case workers.

User Benefits

The application features DDE links to Excel and MS Word, greatly facilitating reporting and letter writing.

Administrative Benefits

Case workers can handle a growing case load. Management reports on caseloads and services are produced easily and

virtually error-free. Caseloads are more evenly balanced between workers.

Program Development Benefits

The application was completed in about four months, roughly half the time it would have taken on the mainframe.

4. System Costs

Project costs have not been computed, but are estimated to be a fraction of the cost of developing and maintaining the application on the IBM 3084.

5. Summary

This was the first application developed at DHSS using a client/server architecture and is considered to be a huge success from the developers and users point of view. A new client/server admissions, discharge and transfer system for the state hospital is in development.

(Blank)

VI

Vendor Analysis

A

Survey Results

As part of the survey, respondents were asked to identify key vendors. These vendors were then given a satisfaction rating on a scale of 1 to 5, 1 being dissatisfied and 5 being very satisfied. In addition, the proportion of customers who mentioned C/S as a key strategy was estimated. Given that the sample sizes are very small, these results should be used to aid understanding rather than as absolute measures. A tabulation of the major vendors is given below, with some respondents citing more than one vendor. In all, there were 259 vendor mentions, many with only a single mention. Several regional, small vendors were mentioned, but only the vendors mentioned more than four times are analyzed in Exhibit VI-1.

The first column names the vendor followed by the number of mentions, then the average rating, percentage of customers mentioning C/S as a strategy and comments raised by respondents.

EXHIBIT VI-1

Vendor Survey Results

Vendor	No. of Mentions	Avg. Rating	% Migrating to C/S	Comments
Amdahl	4	4.50	25	Reliable; good quality and price
Apple Computer	5	4.80	0	Users' choice; reliable, very satisfied
Compaq	6	3.67	67	Less expensive; very reliable
Data General	5	4.20	0	Very good support; specialize in election systems
Digital	8	4.38	13	Good support; reliable service; solid and inexpensive
Dell	6	4.00	50	Cost efficient; excellent warranty
Hewlett-Packard	10	4.40	20	Quality, reliable; high market share [in corrections departments]
IBM	70	3.93	27	Reliable; good support; state policy; service declining
Memorex-Telex	5	3.40	40	Reliable service; always available; poor performance-poor value
NCR	5	2.80	80	Not satisfied
Novell	4	2.00	0	
Small Systems Management	5	2.60	80	
Unisys	13	3.46	46	Very helpful; field engineering good; happy with end results; quality weak; out-of-date
Wang	10	3.50	60	Only minor problems; quality hardware-personnel
WordPerfect	7	4.57	43	User friendly; good support

The average satisfaction rating for all vendor mentions was 3.83. Users were very critical about service—negative comments about service were usually accompanied with a low-satisfaction rating.

(1 or 2). However, it was not unusual to comment that a product required improvement, yet still give the vendor a high satisfaction rating (4 or 5).

Reliability of products and service was a consistent theme by respondents. Comments concerning reliability, or lack thereof, were recorded more frequently than any other single topic.

(Blank)

A

Applications Details

This appendix provides definitions of all the applications identified in this study. The applications are grouped according to categories.

In state and local government, in particular, applications are integrated to reflect business processes. Hence, ordering and inventory systems, traditionally two separate areas for a large retail chain, are combined. Therefore, the definitions in practice are somewhat overlapping. The terminology used here is taken largely from respondents' questionnaire responses.

In the future, more applications will be integrated and it will be more appropriate to consider the entire work flow of an application—made from modules.

Exhibit A-1 includes all applications unique to INPUT's definition of the state and local government industry sector.

EXHIBIT A-1

State and Local Government Industry Application Types

Application Category/Type	Description/Examples
State and Local Government Applications	
Engineering	
• Drafting System	Computer-aided drafting
• Mapping System	Geographic information systems
Hospital Operations	
• Clinic Management	Out-patient records management system
Justice	
• Dispatch	Computer-aided dispatch system for emergency response
• Crime Analysis	Crime analysis systems and reporting
• Police Records	Police records management systems
• Courts	Court scheduling and case tracking
• Probation	Probation management systems
Public Administration	
• Library	Library management systems, applications to track books
• Welfare	Systems to assist case workers track and manage cases
• Permits and licenses	Animal control and registration systems, building permits, business licenses
Public Finance	
• Fund Accounting	Accounting system
• Tax Collection	Tax billing and collection systems, Automatic funds transfer for tax remittance
• Tax Management	Appraisal systems, tax planning and management systems
Purchasing	
• Purchasing	Requisition and purchase order management
• Encumbrance Control	Tracking of purchase commitments from initial requisition through to final payment
State and Local Other	
• Elections	Systems for processing election returns
• Voter Registration	Voter registration systems
State Gov't Other	
• Medicaid	Claims processing for medical care

Exhibit A-2 contains definitions of applications identified in this study that INPUT defines as cross-industry.

EXHIBIT A-2

Cross-Industry Application Types by Category

Application Category/Type	Description/Examples
General Infrastructure	
• Database Conversion—General	Migration to a new database architecture
• Database Conversion—Relational/Distributed	Migration to a relational or distributed (or both) architecture
• Data Conversion	Projects to convert the date from one database environment to another
• Hardware Upgrades	Projects to upgrade or migrate to new hardware
• Imaging Systems	Installation of infrastructure to support imaging applications
• Operating System Upgrades	Operating system upgrades
• Platform Migration—C/S	Projects to upgrade or migrate to new client/server hardware
• Platform Migration—General	Projects to upgrade or migrate to new general purpose hardware or networks
Human Resources	
• Human Resources information system	Human resources information system, HRIS
• Payroll	Payroll processing
Office Systems	
• Electronic mail and messaging systems	Electronic mail systems
• Word Processing Systems	Installation of applications that use word processing
Planning and Analysis	For this report the spreadsheet applications were combined with office systems
• Financial Modeling	Systems to support financial business modeling and analysis
• Spreadsheets/Databases	Applications that use desktop spreadsheets and databases
Telecommunications	
Voice mail	Voice mail systems
Other	
Computer-aided drafting	Drafting system

(Blank)

B

Questionnaire

Questionnaire Used For Case Studies In Chapter 5.

CONFIDENTIAL

**Questionnaire
Client/Server Case Studies—State and Local Government**

1. Organization name: _____

Contact name: _____

2. Application Description:

3. What were the critical issues behind the implementation of this application?

4. Which vendors were considered?

a) System platforms:

b) Applications software:

c) System integrators:

d) Other support organizations, e.g., processing services:

5. Which alternative architecture's were considered?

6. What problems or surprises were encountered?

7. What have been the systems benefits?

- a) User benefits:

- b) Administrative benefits:

c) Program development benefits:

7. How much did it cost to implement? How did that compare to initial expectations?

8. Is there anything else that you would like to add about implementing client/server applications?

C

Vendors

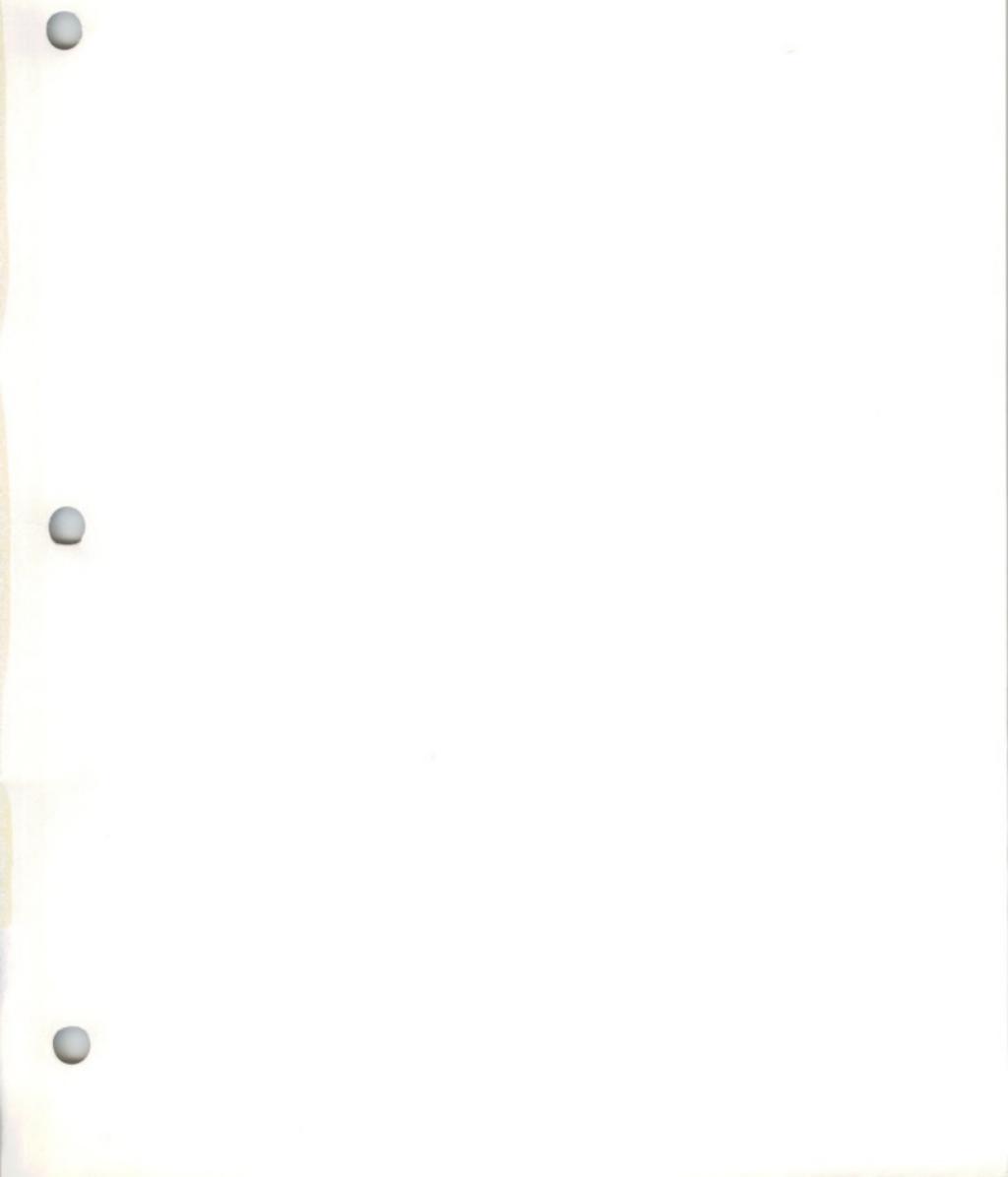
This section gives the names and addresses of vendors mentioned in the report.

EXHIBIT C-1**Vendor Addresses**

Vendor	Address
Amdahl Corporation	1250 East Arques Ave Sunnyvale, CA 94088 Telephone: 408-746-6000
Apple Computer, Inc.	20525 Mariani Avenue Cupertino, CA 95014 Tel: (408) 996-1010
Compaq Computer Corp.	20555 SH 249 MO 040514 Houston, TX 77070 Tel: (713) 370-0670 Fax: (713) 374-1740
Data General Corp.	4400 Computer Drive Westborough, MA 01580 Tel: (508) 848-5000
Digital Equipment Corporation	146 Main Street Maynard, MA 01754 Tel: (508) 493-5111 Fax: (508) 493-8780
Dell Computer Corp.	9505 Arboretum Blvd. Austin, TX 78759 Tel: (512) 338-4400 Fax: (512) 728-3653

EXHIBIT C-1 (Cont.)

Vendor	Address
Hewlett-Packard Co.	3000 Hanover Street Palo Alto, CA 94304 Tel: (415) 857-1501 Fax: (415) 857-5518
IBM	Old Orchard Road Armonk, NY 10504 Tel: (914) 766-1900 Fax: (914) 765-6021
Memorex-Telex Corp.	545 E. John Carpenter Frwy., LB6 Irving, TX 75062 Telephone: 214-444-3500
NCR Corp.	1700 S. Patterson Boulevard Dayton, OH 45479 Tel: (513) 445-5000 Fax: (513) 445-4184
Novell Inc.	122 E 1700 S Provo, UT 84606 Telephone: 801-429-7000
Small Systems Management	
Unisys Corp.	PO Box 500 Blue Bell, PA 19422 Telephone: 215-986-4011
Wang Laboratories, Inc.	1 Industrial Ave Lowell, MA 01851 Telephone: 508-459-5000
WordPerfect	1555 N Technology Way Orem, UT 84057 Telephone: 801-226-5555



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VERTICAL MARKET ANALYSIS

- Client/Server
Applications Trends

Retail Trade

CA
UBRAN

Client/Server Markets and Applications Program

DV 8



A P R I L 1 9 9 4

Client/Server Applications Trends

Retail Trade

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**Client/Server Markets and
Applications Program**

***Client/Server Applications Trends—
Retail Trade***

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I

Introduction

This report analyzes trends in client/server (C/S) applications in the retail trade market segment. It is the eighth in a series of vertical market reports produced as part of INPUT's Client/Server Markets and Applications subscription service.

A

Objectives

Based on a user survey, this report addresses the following issues regarding the retailing sector:

- To what degree is the industry migrating to client/server architectures?
- Which applications are likely to be targeted for implementation over the next two years, and which are headed for a downsized client/server environment?
- Who is managing implementation or conversion of client/server applications? The central information systems (IS) function, user management, retailing's local IS function or third parties?
- To what degree are industry participants looking to outside vendors for products and services?

B

Scope

The analysis focuses on the retail trade industry sector within the United States. This particular study surveys 110 different companies. Approximately 80% of the companies are retail stores and the remaining 20% are restaurants.

The Standard Industrial Classification (SIC) codes listed in Exhibit I-1 define the market.

EXHIBIT I-1**Retail Trade Respondents by Industry Sector**

Code	Description	Number of Different Companies	Companies (Percent)
52xx	Building Materials, Hardware, Garden Supply, and Mobile Home Dealers	5	5
53xx	General Merchandise Stores	29	26
54xx	Food Stores	24	22
55xx	Automotive Dealers and Gasoline Service Stations	3	3
56xx	Apparel and Accessory Stores	13	12
57xx	Home Furniture, Furnishings and Equipment Stores	9	8
58xx	Eating and Drinking Establishments	21	19
59xx	Miscellaneous Retail	6	5

C**Methodology**

Data for this analysis is taken from INPUT's applications database, built from 1993 telephone interviews.

Respondents identified 153 applications or projects they would be implementing over the next two years using their own terminology, rather than using a predetermined set of definitions. Once the survey was completed, INPUT analyzed the project descriptions and coded them into 10 application categories.

Exhibit I-2 lists the applications in each category. Detailed descriptions of each application type is contained in Appendix A.

The sample size is relatively small compared to the size of the market. Graphs and charts are provided to supplement intuition rather than a statistically rigorous analysis of the market.

EXHIBIT I-2

Definition of Retail Trade Application Categories

Application Category	Application Type
Retail Trade Applications	Description/Examples
Distribution & Warehousing Systems	Direct Store Delivery System, Distribution, Freight Payment, Shipment Tracking, Warehouse Management
Electronic Commerce	EDI, Electronic Fund Transfers (EFT), Electronic Payments, Quick Response System, Vendor Interface
Inventory	Inventory Systems, Perpetual Inventory, Rotating Inventory
Marketing Systems	Consumer History, Coupons, Customer Demographic Database, Home Shopping, Merchandise Information
POS Payment Systems	Check Authorization, Credit Checking System, Debit Point-of-Sale Payment System
Purchasing	Ordering, Purchase Tracking, Purchasing, Replenishment Systems
Store Systems	Bar Code - Scanning, Energy Monitoring, Integrated Store Systems, Portable Label Printing System (UPC Marking), Price Look-up, Verification, Price Changing, Scales Management, Shelf Planning System, Store Register Systems, UPC Item File Maintenance System, UPC Item Marking System, Video Rental System

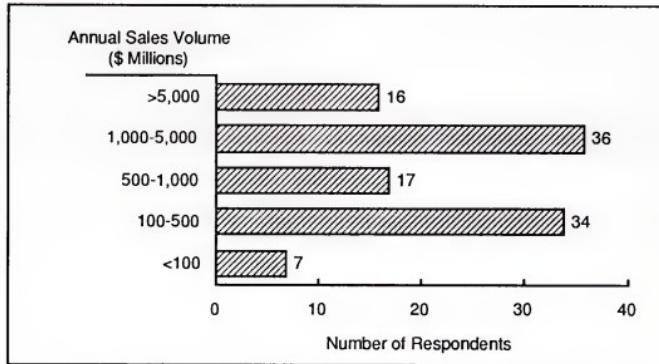
EXHIBIT I-2 (Cont.)

Application Category	Application Type
Cross-Industry Applications	
Financial	Accounts Payable/Receivable, General Ledger, Integrated Financial Systems, Investment Management, Property Management, Treasury Management
Human Resources	Applicant Tracking, Benefits Administration, Labor/Job Scheduling, Management Development, Payroll, Time and Attendance
Infrastructure	Hardware, Software & Network Upgrades
Office Systems (includes 3 spreadsheet applications normally included under Planning & Analysis)	Electronic Mail & Messaging, Desktop Publishing, Integrated Office Systems, Spreadsheets, Word Processing
Telecommunications	Voicemail

In addition to the survey, additional interviews provided information for the case studies in Chapter V. These discuss user perspectives on C/S systems.

D**Characteristics of the Sample****1. Sample Demographics**

Exhibit I-3 shows company distribution according to annual fiscal year 1992 sales.

EXHIBIT I-3**Distribution of Respondents by Sales Volume—Retail Trade**

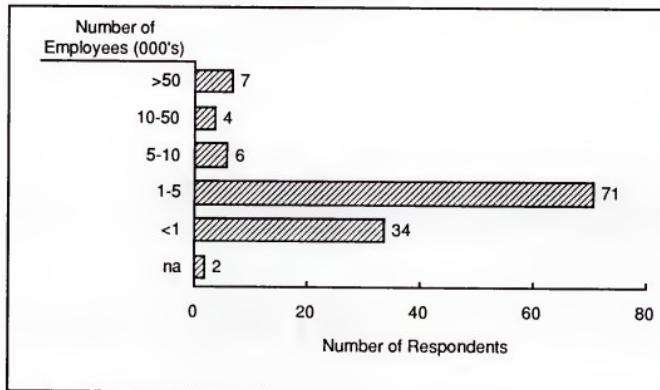
Total Respondents: 110

Companies surveyed have an average annual sales volume of \$2,930 million. The institutions are grouped into four size categories:

- Very Large - Greater than \$5 billion in annual sales
- Large - Between \$1 billion and \$5 billion
- Medium - Between \$500 million and \$1 billion
- Small - Under \$500 million

The average number of employees is approximately 29,600. Exhibit I-4 shows the distribution.

EXHIBIT I-4

**Distribution of Respondents by Number of Employees
Health Services**

Total Respondents: 124

2. Characteristics of Survey Respondents

User managers, with direct responsibility for line or staff operations in a functional area other than IS, responded to the questionnaire in Appendix B. Respondents occasionally referred interviewers to the IS organization. Consequently, respondents, whose distribution is shown in Exhibit I-5, include:

- Line Manager—A manager/executive responsible for line operations at a corporate, store or divisional level (e.g., vice president of operations, store manager, director of product distribution, etc.).
- Staff Manager—A manager/executive in charge of staff operations at a corporate or divisional level (e.g., vice president of human resources, chief financial officer or director of purchasing).
- IS Manager—A manager/executive whose primary responsibility is the management of information systems activities at a corporate or divisional level.

EXHIBIT I-5**Job Classification of Respondents—Retailing**

Job Classification	Respondents (Percent)
Line Manager	27
Staff Manager	76
IS Manager	4

Staff managers represent finance, distribution, inventory, marketing, store operations, human resources and warehousing.

E**Organization**

The remainder of the report is organized into five chapters:

- Chapter II, Executive Overview, summarizes the findings of this study. It provides recommendations for vendors and purchasers of C/S systems.
- Chapter III, Applications Analysis, discusses key applications that will undergo conversion or reimplementation by retailing firms over the next three years. It addresses:
 - Trends in retailing applications
 - Leading issues
 - Analysis of the applications by application category
 - Where client/server systems are being installed
 - Target platforms and platform combinations
 - Anticipated changes in the system environment
- Chapter IV, Management and Budgets, analyzes who will manage the projects and the budget size. It discusses:
 - Project management and control strategy
 - Outside resources

- Near-term expenditures for applications development
- Growth rates for budgets
- Chapter V, Retail Trade Application Case Studies, describes client/server implementations in representative industry applications.
- Chapter VI, Vendor Analysis, reviews respondents comments on leading vendors and identifies technology vendors supplying solutions for the retail market.

F

Related Reports

INPUT has published another report on retailing, within the market analysis program, that complements this report:

Retail Trade Markets, 1993-1998

This report focuses on general industry statistics and trends. It describes retailing applications in detail.

II

Executive Overview

This chapter summarizes the key findings in the report.

- Section A provides a background on the retail industry
- Section B discusses key findings
- Section C provides key statistics
- Section D gives recommendations
- Section E gives conclusions

A

Industry Background

Retailing is undergoing significant changes with:

- The re-engineering of the supplier/retailer relationship
- The growth of discount malls and mail order catalogs
- Mergers and acquisitions of major chains
- Paper handling reduction using electronic forms, imaging and database management systems

There are tremendous pressures on retailing, a somewhat inefficient institution, given the growth of discount malls, home shopping and specialty mail order catalogs. Retailing is labor intensive and the spending, per head on computing equipment, is lower than in most industry sectors.

Well-publicized success stories in retailing include, Wal-Mart's superstore growth and J. C. Penney's recent turnaround. The growth and turnaround can be attributed to careful use of

information systems. Wal-Mart has a perpetual replenishment system that makes key suppliers responsible for managing inventory. As part of its merchandise information system, J. C. Penney has implemented a perpetual replenishment system that is integrated at the point-of-sale ECR system. By consolidating data centers, further savings have been achieved. Replenishment systems, using C/S technology, are revolutionizing retailing.

B

Key Findings**1. Client/Server Migration**

Despite the much-publicized success stories of Wal-Mart and J.C. Penney, the surveyed retailers were slower than respondents in other industries to adopt C/S solutions. Only 24% of applications will be implemented using a C/S architecture, according to respondents. However, retail budgets are growing faster than in many industries. Hence, there is a tremendous opportunity to revolutionize retailing with C/S computer architectures.

2. Applications Opportunities

The main opportunities for C/S applications are:

- Merchandise information systems using EDI
- Quick-response systems
- Virtual inventory systems
- Virtual home shopping systems
- Efficient Consumer Response systems (ECR)
- POS payment systems (debit, credit, check authorization and collection systems)

3. Downsizing

Fred Meyer, a Portland, Oregon retailer described in Chapter V, indicated a desire to migrate applications from an IBM ES/9000 mainframe to IBM RS/6000 workstations. The trend to replace mainframes with workstations in retailing is just beginning. INPUT believes this will continue as organizations adopt RISC-based hardware that offers good price/performance. According to the survey, few organizations were downsizing. Responses indicated many were interested in making business more efficient.

4. Outsourcing

Although secondary research indicates outsourcing as a key strategy for retailers, with 35% of companies using some outsourcing, in this survey, only 7% of new or improved applications were considered for implementation using outsourcing. There are opportunities in electronic commerce systems that trade between retailers, customers and suppliers for new outsourcing services.

5. Systems Management

Retailing is an industry strongly dependent upon corporate IS for systems management. With the advent of client/server systems, there is a slight increase in user participation in systems design. However, this is mainly in financial and human resources systems not managed by IS management or store operations personnel. Store personnel are less likely to participate in system design than corporate staff users.

C

Key Statistics

The survey covered 111 companies and 153 applications. Of the 111 companies surveyed, 107 respondents answered the computer applications segment of the questionnaire that identified future trends.

The percentage of applications moving to C/S is 24%, somewhat lower than in insurance and health services markets.

Budgets for new client/server systems are growing at 30% and for corresponding non-C/S systems at 19%. This makes retailing one

of the fastest growing markets for C/S systems. However, retailing implementation of C/S systems lags behind some industries.

D**Recommendations****1. For Vendors**

The retailing market is ripe for C/S computing. The critical success factors for software vendors, value-added resellers and system integrators will be the ability to:

- Network the installed base of systems
- Sell and install systems efficiently with low overhead
- Work with suppliers and key retailing customers
- Gain successful reference accounts
- Support geographically dispersed stores cost-effectively
- Work effectively with hardware vendors

Hardware vendors need to ensure they have a clear migration path for their customers to newer platforms.

Major software consulting vendors need to partner with specialists in communications, point-of-sale (POS) systems and inventory management to develop integrated C/S packages to support retail operations.

2. For Retailers and Restaurants

Client/server technology, integrated with EDI technology, is revolutionizing the supplier/retailer interface and can help improve business efficiency by reducing time and the paper trail, to process orders and reconcile payments.

E**Conclusions**

Although there is stiff economic competition in the retail industry, retailers are more committed to technology advancement today than they have ever been. Retail technology is entering a time of accelerated growth and radical change. Retailers are scrambling to keep up with the demands of customers and challenges in the industry. Today, technology is no longer just a tool to keep pace with change and growth, it is driving a revolution throughout the retail trade.

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III

Applications Analysis

This chapter analyzes retailing applications in detail. It contrasts C/S applications with non-C/S applications.

- Section A discusses retail applications trends.
- Section B discusses leading IS issues as reported by respondents.
- Section C discusses C/S applications. It estimates the percentage of new, implemented systems using a C/S architecture and describes opportunities for C/S applications.
- Section D discusses target platforms, i.e., mainframe, minicomputer or LAN.
- Section E shows how the systems environment is changing.

A

Retail Applications Trends

A decade ago, IT was retailing a powerful new tool for:

- Managing inventory
- Tracking and responding to customer needs
- Communicating with suppliers

Today, IT is:

- Influencing “consumer behavior”

- Creating radically new approaches to:
 - Product delivery
 - Inventory management
 - Customer payment alternatives
- Giving way to new retail concepts

The following key trends will shape retail IT development and implementation in the next few years:

- Increased outsourcing
- Rapid growth in C/S technology
- Increased spending on POS equipment and payment systems
- Computer-based integrated merchandise allocation systems
- Virtual home shopping
- Virtual inventory

1. Increased Outsourcing

Outsourcing continues to be a viable approach to retail IT management. Industry estimates indicate 35% of retailers are presently outsourcing at least one system function and plan to continue to outsource new developments. Outsourcing will become increasingly popular as retail companies find they cannot develop innovative technology solutions on their own, and within the time requirements needed to be competitive. In particular, quick response systems and EDI systems are areas where outsourcing is likely to grow.

2. Rapid Growth in C/S Technology

Approximately 85% of retail IT systems are primarily implemented on a mainframe/minicomputer environment, according to industry estimates, and radical changes in IT systems development are predicted. Over the next 2 years, close to 60% of new systems will be implemented on a mainframe or minicomputer and nearly 30% of new applications on a LAN

platform. Hence, one can expect the number of applications running on mainframes to gradually decline.

Retailers are moving from mainframe/minicomputer platforms due to many factors including:

- Improved, easier to use C/S software development tools
- Standard, cost-effective hardware
- Ease of adding numerous applications without replacing computer hardware

A client/server environment allows a company to grow, change and add numerous applications. It allows users to design the user interfaces that match their requirements on PCs and workstations.

3. Increased Spending on POS Equipment and POS Payment Systems

According to some industry estimates, POS terminals and devices presently account for more than 50% of store IT expenditures in the retail industry. This can reach as high as 65% in supermarkets and grocery stores. Supermarkets/grocery stores will continue to improve their POS equipment, and plan to install:

- Check authorization and collection systems
- Direct debit and credit systems
- ACH EFT debit systems
- Video rental systems
- “Frequent shopper” coupon systems

Retailers want to provide multiple methods of payment to:

- Simplify and encourage spending
- Cut down on bad check losses
- Generate customer loyalty to garner repeat business

4. Computer-based Integrated Merchandise Allocation Systems

More than 50% of retailers are using computer-based merchandise allocation systems and have rapidly integrated "quick response" technologies (EDI) with computer-based merchandise allocation systems. Integrated merchandise allocation systems is expected to be one of the major growth areas for C/S systems over the next five years. The reason is, retailers, who are using this technology, are reporting:

- Dramatic increases in inventory turns
- Increased sales
- Increase in customer satisfaction
- Reduction in inventory levels
- Reduction in operating costs
- Reduction in interstore transfers
- Reduction in markdowns

5. Virtual Home Shopping

Virtual Home Shopping is retailing's new frontier—a \$4 billion business that retailers expect will explosively grow.

- Macy's has announced "TV Macy's," a 24-hour channel scheduled for launch in the fall of 1994. Other retailers are taking advantage of such existing channels as QVC Network and Infomercials.
- Saks Fifth Avenue, Marshall Fields, and Bloomingdale's have recently sold merchandise on "NBC Direct."
- Nordstrom has announced plans to develop an "interactive shopping" service using digital technology still in development.

Home shopping will accelerate retail "interactive shopping" and allow consumers to request information and place orders using their TV sets. Just as technology allowed banking via PC, phone or ATM machines in the 1980s, consumers in the 1990s are able to shop anywhere, anytime.

6. Virtual Inventory

Virtual inventory is the elimination of physical inventory through the use of electronic storage and delivery (EDI). Economics of the 1990s is driving the demand toward virtual inventory technology.

Egghead Software has developed a new virtual inventory service called Egghead Express, developed to better serve the company's corporate customers and scale order processing costs. Egghead's customers can electronically order software through its electronic catalog where the customers simply "point and click" to place an order. It is pure EDI—with no human intervention until a pick list is generated in the warehouse. By doing away with manual paper purchase orders, this system dramatically cuts the cost of preparing transactions.

Blockbuster Entertainment has also developed a virtual inventory system called "Soundsational." This system is a joint development effort created by Blockbuster and IBM. It allows network distribution of electronic entertainment products directly to Blockbuster's stores, eliminating the store's need to carry physical inventory. The customer may access CDs, videotapes and audiotapes.

The system allows Blockbuster's customers to identify, preview and select products by touching a kiosk screen. The customer will inform the front desk clerk of his or her selection. The clerk will then order the product from a central host computer using a PC. The host system will then transmit the product to the store, where it will be manufactured (with packaging artwork) in a few minutes.

The system is currently being tested but will not be fully implemented until the:

- Technology is faster
- Licensing agreements are complete
- In-store equipment can manufacture and assemble products rapidly and economically

Egghead and Blockbuster benefit from virtual inventory with:

- Improved inventory management
- Better customer satisfaction
- Increased revenue and margins

The content providers benefit from:

- Fewer returns
- Access to their entire catalog
- New international opportunities

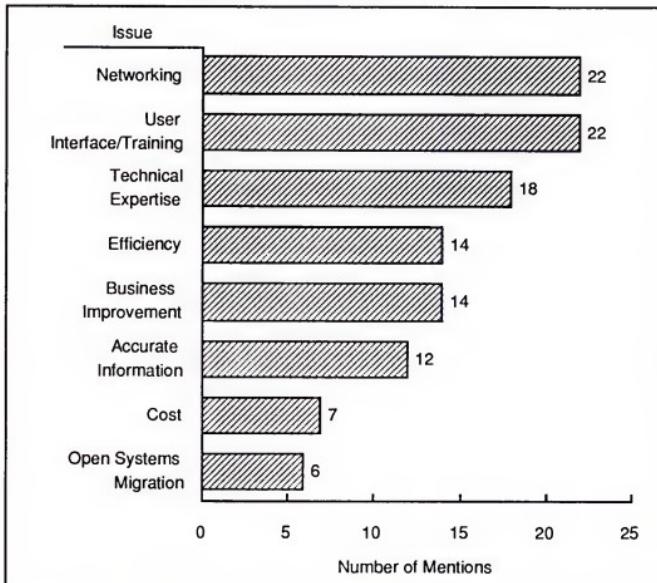
B

Leading IS Issues and User Concerns

1. Ranking of Leading IS Issues

When asked to identify the major issues relevant to IS in the next two years, 107 respondents gave free-form answers that were coded by INPUT. Some respondents gave multiple answers and others gave none, resulting in 115 responses tabulated in Exhibit III-1.

EXHIBIT III-1

Leading IS Issues—Retail Trade*Total Responses: 115***2. Discussion Of Issues**

Key issues shown in Exhibit III-1 are discussed in detail below.

3. Networking

Retailers need networks, WANs and LANs, to work easily and reliably.

Concern was expressed among survey respondents that EDI systems can be unreliable and hard to use. Networking is also a prime concern of accounting departments, where EDI is being added to financial systems.

Linking corporate head offices to stores using a WAN is a key priority for retailers. Several large chains use satellite transmission between sites. Ensuring WANs are supported by applications software is a prime concern. Many organizations are interested in reducing the paperwork between offices using networking.

Retailers are also concerned about LANs. These are used to connect store floors to store back offices where the systems are used. They need to be simple to administer, reliable and provide fast customer response when linked to POS equipment.

4. User Interface and Training

Almost one-fifth of respondents mentioned they either need better user interfaces to their systems or better user training. A key concern of retailers is high personnel turnover among stores and the lack of money to train them. Hence, any store system must be as easy to use as a cash register.

Retailers also want simple interfaces to inventory systems—systems that can be very complex. Training of store and warehouse personnel is critical for those implementing perpetual inventory and “quick response” systems.

Customer databases that show customer demographics, purchase patterns and buyer's histories (Frequent Shopper Systems) are another areas where user interfaces can be improved. Shelf planning systems also require a simple user interface.

5. Technical Expertise

More than 10% of respondents are concerned about keeping up with technology. This concern is becoming more prevalent among retailers than among other market segments. Being aware of how competitors and others in the industry use the technology is another concern.

6. Efficiency

Many retailers are concerned with making their business more responsive to customer demand and reacting quickly to changing market conditions. There are several areas where retailers want to speed up operations:

- Distribution management
- Payroll
- Ordering
- In-store check authorization and payment methods (i.e., credit, debit)

Retailers are particularly interested in installing merchandise allocation systems using EDI technology and Quick Response Systems. Several stores are interested in improving their personnel scheduling with time and attendance systems.

7. Business Improvement

Several respondents are interested in using systems to improve their business. They want:

- Merchandise allocation systems using EDI
- Human resource systems to manage employee information and benefits
- Direct store delivery systems (DSD)
- Shelf planning systems
- Price look-up, verification and changing systems

Two organizations, one a restaurant chain, the other a retail chain, are adding laptop computers to improve communications between stores and head offices.

8. Accurate Information

Information is required for several store functions, in particular:

- Orders must be correctly entered into a data entry system
- Pricing must be accurate in POS systems
- Store managers and corporate executives need accurate reports from finance and inventory
- Human resources
- Consumer research database

Stores are particularly interested in getting timely and accurate sales reports to corporate offices. One company is decentralizing its human resources database so job applicants and new hires can enter data at its local store, rather sending a form to a central personnel office.

Time and attendance tracking is another area where accurate information is essential. Many payroll systems are linked to time clocks. However, some stores are interested in improving their time recording along with tracking other employee-related performance factors, in order to create incentive pay schemes.

9. Cost

Most organizations are interested in substituting technology for labor, thereby reducing payroll costs. Very few, explicitly named systems cost as an issue. However, nearly all retailers insisted on seeing a return on investment within one to two years.

10. Open Systems Migration

Six companies mentioned migrating to open systems was a concern. Retailers are interested in cross-platform technologies and migrating software from one platform to another. One is concerned about porting code to a UNIX platform and wants the operating system to provide a stable environment for developers.

11. Other Leading IS Issues

Systems integration, networking and communications are concerns of three. Several personnel issues were raised:

- Growing chains want to be able to expand with minimum systems impact as new staff is hired.
- Some established chains are concerned about layoffs and do not want to cut jobs.
- Other established chains want to replace people with systems, particularly cutting down on staff who order by using more automation.
- Retraining mainframe programmers to work in a networked environment.

Unlike other industries, standardization was not raised as a *major* issue, except by one respondent implementing an EDI system. This may be because many standards have already been established for electronic commerce—bar-codes and accounting in the retail industry.

In this survey for C/S applications, 36% of respondents were interested in an increase of standards, and for non-C/S applications, only 15% were interested in standards. This compares with the average among 2,000 users, across multiple industry sectors, surveyed in INPUT's annual user survey.

C

Client/Server Applications

1. Client/Server Penetration by Application Category

C/S systems will achieve relatively low penetration rates in the retailing industry over the next few years. Respondents were asked if they were using, or planning to use, client/server systems. Exhibit III-2 shows the number of applications surveyed in each category of the applications categories given in Exhibit I-2. It also denotes the number of respondents indicating that C/S would be a major strategy.

On average, C/S architecture is targeted for 37 of the 153 applications, or 24% of the systems. Though not as pervasive in

retailing as in the manufacturing sectors, this is considerably lower in some other industries like health care and insurance.

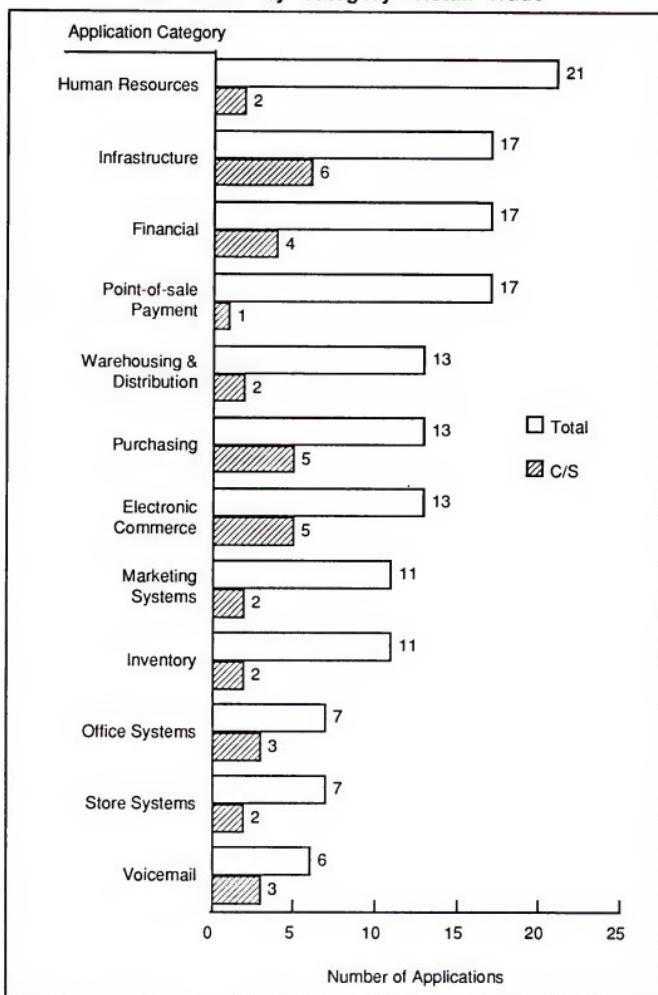
Approximately half of the applications are specific to retailing, rather than cross-industry applications. These applications include:

- Distribution & Warehousing Systems
- Electronic Commerce
- Inventory
- Marketing Systems
- POS Payment Systems
- Purchasing
- Store Systems

For these key retailing systems, the percentage using a C/S architecture is about 22%, showing that in core business operations there is slow movement toward C/S systems.

EXHIBIT III-2

**Planned Application Changes and
Use of C/S by Category—Retail Trade**

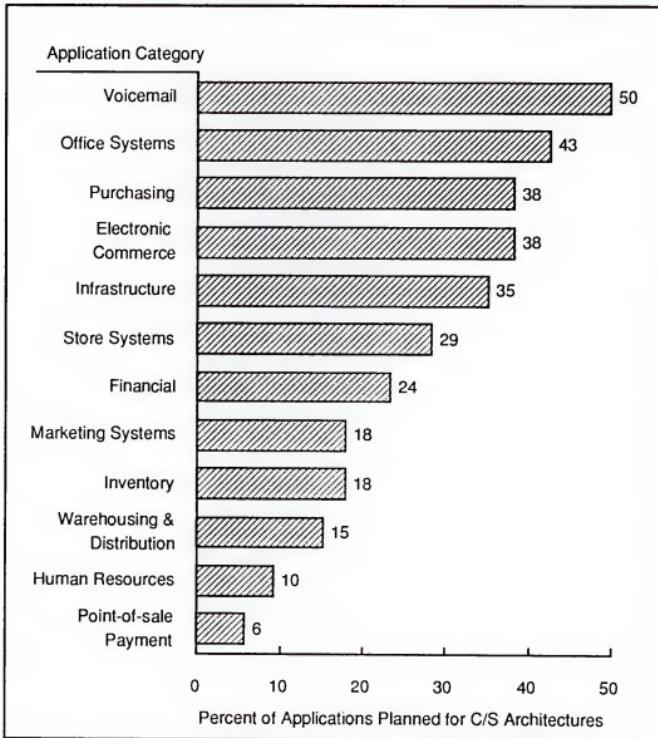


153 Applications; 107 Respondents

Exhibit III-3 takes the same data as Exhibit III-2 and expresses C/S penetration as a percentage of systems installed for each application category. The application categories are then ranked according to the percentage of systems that are migrating to C/S architectures.

EXHIBIT III-3

Use of C/S by Application Categories—Retail Trade



Below each category in the chart above, is a detailed explanation suggesting opportunities for system vendors.

Voicemail, six respondents are implementing voicemail systems and three are implementing client/server systems. In these cases, they are integrating their PBX with corporate computing systems, rather than relying on a standalone voicemail system. This is a key trend that is likely to continue as companies like Novell and AT&T integrate telephony with networked computing.

Office systems, in particular electronic mail systems, are strong candidates for client/server implementation. Typically, office systems rank high in many other vertical markets. However, the penetration of C/S systems (43%) is somewhat lower than the corresponding 73% penetration in the health services market where client/server systems are more prevalent. In particular, office LANs that run word processing and electronic mail are being extended to integrate with inventory and ordering systems. Corporate staff is also interested in analyzing point-of-sale data to develop targeted promotions based on purchasers' buying behavior.

Purchasing systems are being integrated with EDI and inventory systems. Purchasing systems include order entry, order management and automated ordering. The systems that plan to use a client/server architecture are all order entry systems.

Electronic commerce includes EDI systems. In particular, the main growth in C/S systems is for Quick Response systems. Client/server architectures are preferred where EDI systems integrate with inventory and purchasing systems.

Many retailers need to upgrade their *infrastructure*. Three respondents mentioned they are replacing IBM's AS/400 computers with faster RS/6000 RISC-based workstations. One respondent was upgrading hardware to move away from the mainframe. In addition, three respondents are upgrading their hardware to implement a client/server architecture—the primary reason for changing their computing environment.

Store systems are undergoing re-engineering efforts as stores use information captured at checkouts. The systems being implemented as client/server systems are those that combine point-of-sale information with consumer research and ordering systems.

Financial systems in retailing typically lag behind those in other industries, with a relatively low 24% migrating to a C/S architecture.

Marketing systems include customer demographics databases and merchandise information systems. Customer demographics databases are rapidly moving toward client/server architectures.

Inventory systems moving to a C/S architecture, are for inventory planning. As it is, many inventory management packages run on a minicomputer or mainframe. Until there are complete packages that run across multiple platforms using a C/S architecture, retailers will be reluctant to adopt C/S architectures for this application.

Warehousing and distribution systems include distribution systems, shipment tracking systems and warehouse management systems. One distribution system and a freight payment system are moving toward a C/S architecture, but in general, most are implemented on mainframes and minicomputers.

Human resources systems are not moving as fast to C/S architectures in retailing as in some other industries. Labor scheduling software is frequently implemented on a mainframe.

POS payment systems are moving to C/S architectures, but respondents indicate that either their POS terminals are on a simple peer-to-peer LAN or connected as terminals to a minicomputer or mainframe. The main reason given for upgrading POS systems was for more efficient customer tracking.

Exhibit III-4 gives a detailed breakdown of the data collected. It shows, for each category, the number of applications surveyed in the category, the strategy and the main platforms and major resources used.

EXHIBIT III-4

Detailed Data from the Industry Survey

Application Category	Strategy			Platform			Resources							
	Num. Apps.	C/S	Down-sizing	C/S or LAN	Mini	Main-frame	Corp IS	Div'l IS	User Staff	SI	Other Out-side Svcs.	Pack-aged SW	Using EDI	Out-srcd
All Applications														
Inventory	11	2	1	1	0	9	9	0	3	4	1	4	11	1
Marketing Systems	11	2	2	4	2	5	5	3	5	1	8	4	6	1
Electronic Commerce	13	5	0	4	2	7	6	2	4	2	6	2	13	2
Purchasing	13	5	1	5	5	2	8	0	4	1	2	8	9	0
Warehousing & Distribution	13	2	0	3	2	6	11	3	5	1	4	3	9	1
Point-of-Sale Payment	17	1	3	2	3	6	7	3	6	3	8	6	7	1
Financial	17	4	3	8	2	8	13	6	15	7	7	12	7	0
Infrastructure	17	6	3	8	2	7	10	5	6	4	8	8	7	1
Human Resources	21	2	1	3	1	14	16	5	4	1	6	8	9	2
TOTAL - All Applications	153	37	17	43	21	69	98	29	60	28	60	63	83	10
Client/Server Applications														
Voicemail	3	1	1	1	1	1	0	1	1	2	1	0	0	0
Store Systems	2	0	0	0	1	2	0	1	0	1	0	0	0	0
Office Systems	3	0	2	0	2	1	1	2	1	2	3	1	0	0
Inventory	2	0	1	0	2	1	0	0	1	0	1	0	1	0
Marketing Systems	2	1	2	0	0	0	0	0	1	0	2	1	1	1
Electronic Commerce	5	0	2	0	4	3	1	2	2	4	1	5	1	1
Purchasing	5	1	4	0	0	1	0	2	0	1	4	3	0	0
Warehousing & Distribution	2	0	1	0	2	2	0	1	0	0	0	0	1	0
Point-of-Sale Payment	1	1	0	0	0	1	0	0	0	1	0	0	0	1
Financial	4	1	1	1	2	4	0	4	3	2	4	1	0	0
Infrastructure	6	3	4	1	2	6	2	2	2	3	3	4	0	0
Human Resources	2	0	1	0	1	2	0	1	0	0	0	0	0	0
TOTAL - C/S Applications	37	8	19	3	17	24	4	17	10	18	18	18	18	3
Comparison of C/S Applications with Other Applications														
Percentage for All Applications (%)	24	11	28	14	45	64	19	39	18	39	41	54	7	
Percentage for C/S Applications (%)	100	22	51	8	46	65	11	46	27	49	49	49	8	

An explanation of the column headings follows:

- “Number of Applications” is the total number of applications for each of the application categories.
- The “Strategy” heading contains two subheadings, “Client/Server” and “Downsizing.” The “Client/Server” count by category indicates the number of applications, within the category, being implemented using a C/S architecture. The count under the heading “Downsizing” represents the number of client/server applications being implemented as part of a general downsizing strategy.
- The “Platform” heading indicates the number of times one of the three major platform classes was mentioned as the key implementation platform.
- The “Resources” heading covers six potential sources of resources being employed as part of the implementation process. More than one response per application was permitted.
- Finally, for each application, respondents were asked to indicate whether the application would use EDI or be outsourced. The last two columns give a tabulation of those responses.

An explanation of the rows is as follows:

- The first set of rows represents the leading application categories.
- The “TOTAL—All applications” row adds up the rows describing the application categories.
- The above rows are repeated for applications where the respondents indicated a major strategy to move to C/S systems.
- The next to last row takes the “TOTAL—All applications” and divides each column total by the number of applications to get a percentage. The final row calculates a similar percentage for C/S applications, for comparison with the population as a whole.

2. Observations on the Sample Mix

The following observations can be made about the C/S applications in the above table:

- Retailing is behind many other sectors in moving to C/S architectures.
- Downsizing is twice as likely to be a consideration where C/S systems are being implemented.
- C/S migration is at the expense of minicomputers more than mainframes. In general, 14% of applications are using a minicomputer as a primary platform with only 8% of applications moving toward a C/S architecture using a minicomputer.
- Outside services, including system integrators and user management, are more likely to be involved in implementing C/S architectures than other systems.

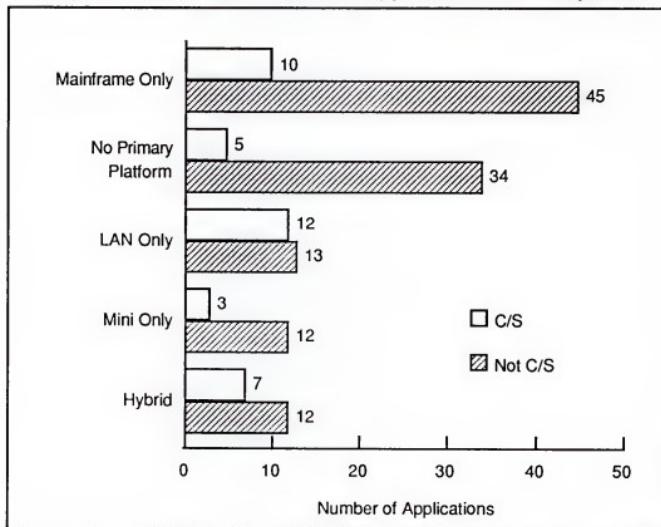
D

Target Platforms

Exhibit III-5 shows the target platforms for the 153 applications in the sample for which platform information was available. Users were asked to identify their primary application platform for applications undergoing major changes. Some respondents did not specify a platform, while others specified multiple platforms. For example, a single application could be on a LAN implementation and a mainframe. Three respondents specified that they are planning to implement a multi-tier C/S system with LAN, minicomputer and mainframe.

EXHIBIT III-5

Target Platforms for Planned Applications Development



Overall, there is still a strong reliance on mainframes, with 45% of applications using a mainframe, either alone, or with other components. Out of 55 mainframe applications, 10 are C/S systems. Respondents answered "no primary platform" when no a particular preference was voiced for any given primary platform. Hence, this category may also include hybrid systems.

An analysis of platform by institution size indicates mini-computer-only solutions are found in smaller organizations with less than \$500 million in annual revenues. Larger organizations are much more likely to integrate LANs with mainframe or minicomputer servers.

E**Anticipated Changes in the Systems Environment**

Respondents provided information on specific changes in their systems environment over the next two years. Responses fell into four categories.

1. Upgrades

Sixty-three (63) of 107 respondents, or 56%, anticipate they will be upgrading their systems over the next two years. Of those wanting to upgrade, just over 20% are moving to client/server systems. This is slightly lower than the sample estimate (24%) of applications moving to C/S systems. The upgrades were evenly distributed across all SIC codes and all sizes of companies.

2. Increased Standardization

Movement toward increasing standardization in platforms and operating environments was predicted by 22 of 107 (about 20%) of the respondents. This is much lower than in some other industries. It may be because retailing has highly specialized vendors and limited platform choices that exist in other areas like health services. Retailers typically use more mature technology than other industries, hence, vendors already support standards. Also many industry standards have already been defined for systems interoperability in retailing.

3. Migration to C/S

A relatively low proportion of retail trade respondents (24 %) are adopting C/S migration strategies, compared with other industries. However, for key applications like customer databases and perpetual inventory systems, C/S technology is key.

4. Downsizing

Only 10% of applications are being downsized. Downsizing is not, generally, a major strategy in the retail trade sector, however, there is definitely a move toward it among larger retailers.

The main applications being re-engineered in organizations that are downsizing are:

- Financial
- Point-of-sale
- Marketing systems

In addition, organizations downsizing are interested in upgrading their hardware to more cost-effective platforms. For example, one organization is interested in moving applications off

the mainframe. Other organizations are interested in implementing faster RISC-based workstations.

G

Client/Server Implementation by Company Size

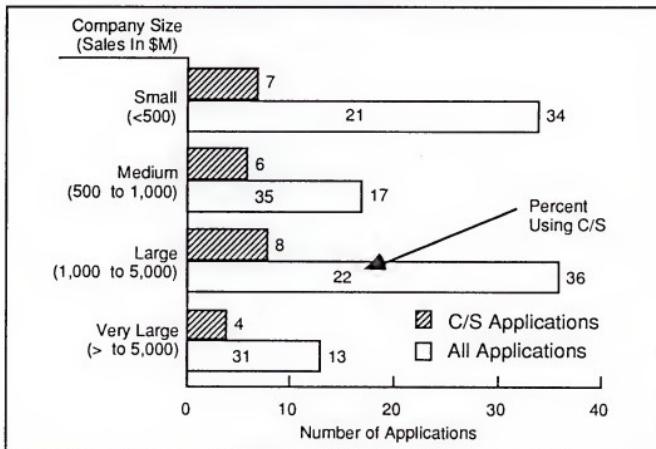
Of the 100 companies interviewed, 25% indicated a movement toward a C/S strategy.

Exhibit III-6 shows C/S implementations are more likely in very large institutions (more than \$5 billion in annual revenues) and medium-sized (\$1 billion to \$5 billion) with the probability of having a C/S strategy being 35% and 31%, respectively. An explanation for this is that very large companies need to cut costs and have the resources to invest in systems that enable them to remain competitive.

Small companies are more conservative and less likely to move to a C/S architecture. Medium-sized companies tend to be flexible and ready to implement a C/S architecture to improve their customer databases and ordering systems.

EXHIBIT III-6

Use of C/S as a Function of Company Size



IV

Management And Budgets

This chapter discusses applications management and budgeting. The chapter is organized as follows:

- Section A provides an analysis of the role that IS departments and user management play in project management of applications.
- Section B analyzes resources being used to implement applications, the emphasis being on development rather than overall project management.
- Section C analyzes expenditure plans, that is, estimated budget sizes for investment in new systems.
- Section D analyzes budget growth rates—the amount that respondents expect their annual budgets to grow over the next two years.
- Section E shows high growth, large budget applications.

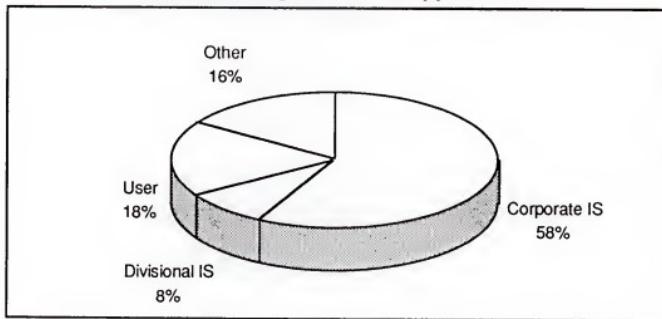
A

Project Management

Respondents were asked, for each application, who was managing the project. Corporate IS is the project manager for more than half the applications in the retail trade. Corporate IS has more influence on retail systems than in many other industries. Many of the projects classified as managed by "other" were managed by a joint committee of IS and users.

- Eighteen percent (18%) of the respondents' applications will be handled by user management. This is comparable to manufacturing industries and much lower than the 40% found in banking and finance.
- Corporate IS will manage 58% of the projects. Divisional IS will manage 8%.

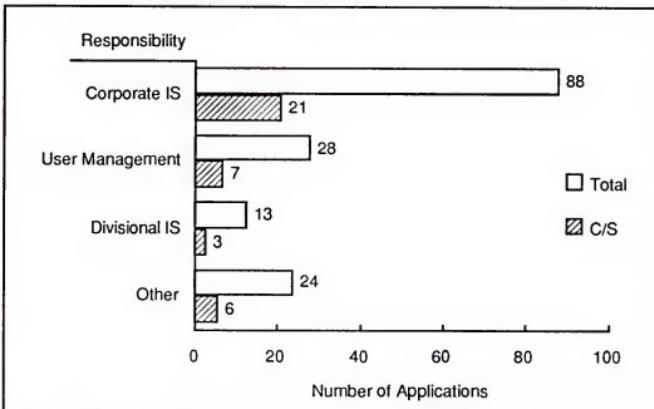
Of 200 applications, 83 of them are moving, or have already migrated, to client/server solutions. Exhibit IV-1 graphically shows the project management responsibilities, as a percentage, for all applications.

EXHIBIT IV-1**Project Management for Applications**

Total Respondents: 153

Exhibit IV-2 shows the number of applications managed by each organization for the entire application set and exclusively for client/server applications.

EXHIBIT IV-2

Primary Project Management Responsibility

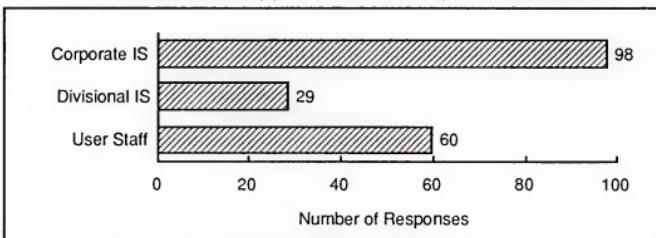
Total Applications: 153

Unlike other industries where C/S systems are sometimes more likely to be managed by users, in retailing C/S applications are managed by IS organizations. This is because in retailing, the user organizations are typically store or warehouse personnel. They have no time to manage computers. One-third of the systems managed by users are accounting or human resources systems and another third are marketing information systems. The remainder are inventory systems.

B**Implementation Strategy****Sources of Development Resources**

Exhibit IV-3 shows the resources required to implement the 153 applications. In some cases, an organization is mentioned more than once. Corporate IS still plays a strong role in applications development in the retail sector, being mentioned 98 times.

EXHIBIT IV-3

Internal Sources of Applications Development Resources

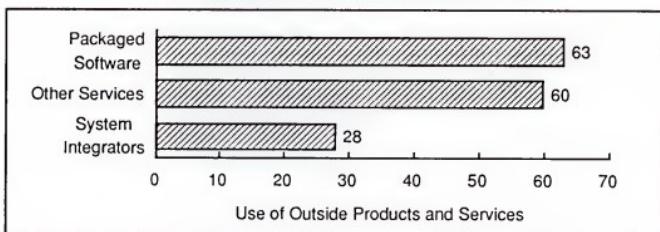
For almost 40% of the projects, user line or staff management will assume direct implementation responsibility. This is close to double the corresponding average for the manufacturing industry sectors.

Size of institution is not a differentiating factor for project implementation strategy. Central IS, a primary resource in 64% of the applications, continues to have a key role in systems implementation whether the organization is large or small.

1. Use of Software Products and External Resources

As shown in Exhibit IV-4, more than 40% of the implementations planned for the next two years will use software packages.

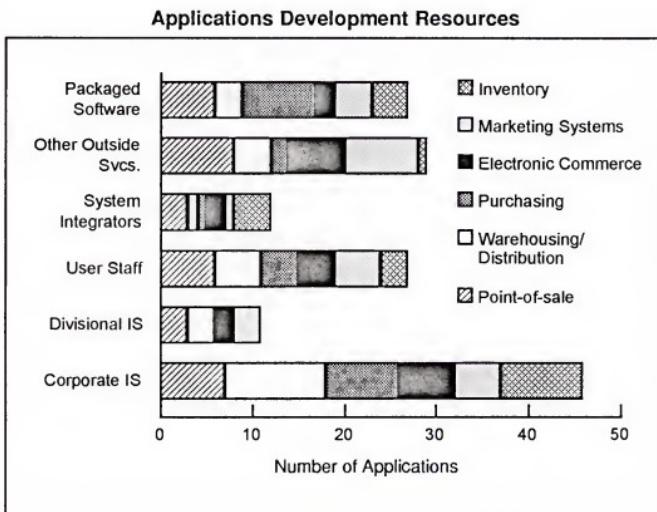
EXHIBIT IV-4

Use of Outside Products and Services

2. Resource Use by Application Category

Exhibit IV-5 takes the major application groupings and identifies resources used to implement them.

EXHIBIT IV-5



The length of each row measures the number of resource mentions and clearly, central IS is the most frequently used resource.

Software packages are most frequently used for purchasing and warehousing applications. They are also likely to be used for cross-industry accounting and office automation applications.

C

Expenditure Plans

Exhibit IV-6 shows the anticipated amount each respondent expects to spend on applications changes in 1994. The spending amounts, shown as a range, are plotted against the number of mentions. The shading differentiates C/S as a key strategy and those that are not, marked non-C/S. As can be seen in the \$1

million to \$5 million range, a high proportion of C/S systems are planned. These are most likely production systems, given the size of the expenditures. At the top end of the range, six respondents indicated they would spend more than \$10 million on implementing a C/S strategy.

EXHIBIT IV-6

Expected IS Spending in 1994

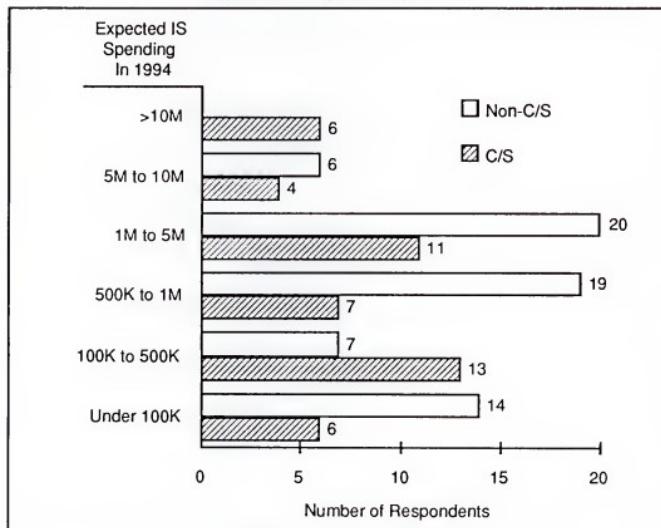
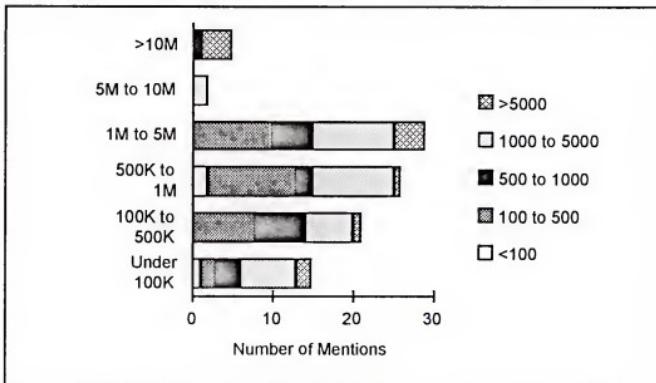


Exhibit IV-7 shows planned spending by company size. The legend give company revenues in \$ millions. Companies usually spend no more than 1% of their revenues on new systems.

EXHIBIT IV-7

Spending on Applications Changes by Company Size



D

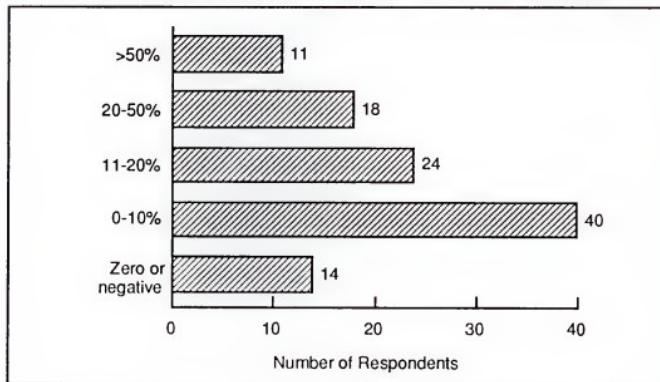
Budget Growth Rate

Respondents were asked how much they expected their IS budget to grow annually over the next few years excluding hardware, for applications exclusively. Spending rates for applications improvements and IS overall (this includes personnel costs, equipment upgrades and support) are above industry norms. On average, total IS and applications development spending are expected to grow at an annual rate of 18%.

Exhibit IV-8 shows the distribution of application budget growth rates. As can be seen, most respondents expected a 0-10% growth rate. However, 20% of the respondents reported a 20% to 50% rate of growth.

EXHIBIT IV-8

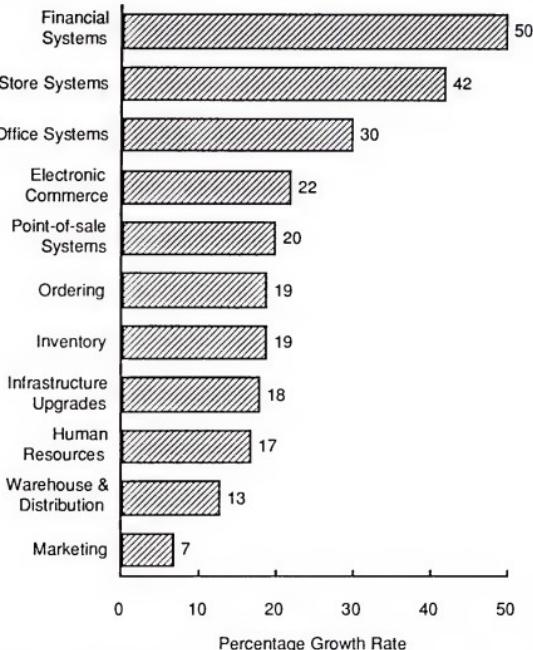
Annual Spending Growth Rates for Applications Development



Examining the data in more detail, the applications being implemented, where the budgets are growing the fastest, are shown in Exhibit IV-9.

Budget growth rate is higher in the retailing industry than in some other sectors. Financial applications budgets are rapidly growing as traditional accounting applications are integrated with merchandise information systems and suppliers' systems to create perpetual inventory/replenishment systems.

EXHIBIT IV-9

Budget Growth Rates for Select Applications**E****Investment in IT and Budget Growth Rate**

The survey did not ask for specific application budgets. However, it did ask respondents to identify how much they were investing in IT. For each application, the opportunity was ranked as high growth, if the average growth rate was over 30%, medium growth, if it was from 15% to 30% and slow growth, if it was less than 15%. Opportunities were identified as large, if the budget was usually greater than \$1 million and small if the budget was less than \$1 million. This resulted in Exhibit IV-10 for the application categories.

EXHIBIT IV-10

Investment and Budget Growth

	High Growth >30%	Medium Growth 15% to 30%	Low Growth <15%
Large Budget (\$ Millions)	Financial	Electronic Commerce	
Small Budget (\$ Thousands)	Store Systems	Human Resources Infrastructure Inventory Warehousing Office Systems	Purchasing Marketing Systems

The survey suggests that the best opportunities are in financial applications and electronic commerce. Store systems also offer profitable growth opportunities.

V

Retail Trade Application Case Studies

This chapter presents case studies based on interviews with three retailers. The organizations were selected because they show diverse activities that characterize the retail trade. The first is an emerging chain of specialty apparel that is outsourcing its C/S systems. The second is a supermarket chain recently acquired by a larger chain and uses HP and IBM computers. The third retailer is planning to replace an IBM mainframe with RISC-based workstations.

INPUT interviewed professionals at the following institutions:

- Allied Stores—discount accessories retailer
- Bel Air Markets (subsidiary of Raley's)—supermarket chain
- Fred Meyer—superstore chain

The above organizations had different levels of activity in client/server systems.

The organizations surveyed do not feel applications software vendors offer a wide enough range of packaged solutions. Thus, they rely on internal resources or close cooperation with an outside vendor to customize software to meet their needs.

A

Alliance Stores, Pasadena, CA

Alliance Stores corporate headquarters is located at 711 Mission Street, Pasadena, California 91030. The company is three years old and specializes in women's fashion accessories. The company

presently has 25 stores located throughout the country in various discount malls.

Alliance Stores plans to continue its expansion to one hundred stores over the next five to ten years. The company sales in FY1992-1993, were just over \$7 million. Each year that Alliance Stores has been in business, sales have doubled. The survey was conducted with the founder and CEO of Alliance Stores, Robert Greening.

1. IS Organization Structure

The IS structure is centralized at the corporate headquarters, with a Director of IS and one full-time and one part-time data entry person. The company has implemented a Merchandise Information System (not using EDI); accounting system; sales audit system; human resource system; and electronic mail system, since the founding of the company. The development of these systems is outsourced through a small company, Data Strategies, which devotes 100% of its time to Alliance Stores. The heart of these systems is (1) Merchandise Information System and (2) the Accounting System. Because the systems are not integrated with each other, data entry personnel have to separately input orders into each individual system.

2. New Applications to be Implemented in the Next Few Years

Alliance Stores plans to implement LAN and WAN; a price look-up system, POS Audit System; and a fully integrated EDI Quick Response System throughout all its stores. It also plans to fully integrate the Merchandise Information System and Accounting System in order to have a perpetual inventory/replenishment ordering system. Alliance Stores plans to outsource this development effort in 1994. However, it has not chosen the systems integrator for this development and installation.

3. C/S Development

Alliance Stores plans to have its applications running in a C/S environment by spring 1994. Alliance Stores is a young company and has had the luxury of developing systems from scratch in a C/S environment. Michael Greening, the CFO and IS Director, has managed the C/S development from the start by implementing corporate and store systems. He is planning and

upgrading the company's systems with the goal of having efficient systems accommodate a chain of 100 stores. Alliance stores will outsource all its developments with selected systems integrators and specialized systems vendors for specific applications.

4. Hardware, Software and Networking

The company has fully used standard 486 PC clone hardware for all its applications at the corporate and store system level. All applications are running on a MS-DOS or Windows operating system. Dial-up lines are used with 9600 modems for the electronic mail system. As yet, no LAN or WAN has been installed throughout the stores.

5. IS Budget

Alliance Stores has spent approximately \$200,000 annually for developing and maintaining IS applications. It plans to spend 1% of total sales annually, for maintaining and developing new systems, over the next few years.

6. Vendors Providing Computers, Development, Systems Integration and Specific Applications

Exhibit V-1 shows the vendors that supply Alliance Stores, its products, strengths and weaknesses. The main strength of the company is that it is outsourcing many critical functions in order to grow. Its electronic mail is outsourced to MCI, which it finds very beneficial.

EXHIBIT V-1

Vendors Supplying Alliance Stores

Vendor	Product/Service	Strengths	Weaknesses
Data Strategies	Merchandise Information	<ul style="list-style-type: none"> Small - Alliance gets 100% of its attention Specifications designed specially for Alliance Stores 	<ul style="list-style-type: none"> They are not big enough to grow with Alliance
Retail Accounting	Accounting Systems	<ul style="list-style-type: none"> Very good software 	<ul style="list-style-type: none"> Not easily modifiable Not integrated with Merchandise Info.
ADP	Human Resource System	<ul style="list-style-type: none"> Excellent system. Payroll is networked to ADP 	
MCI	Electronic Mail	<ul style="list-style-type: none"> Excellent system Provides total written communication between headquarters and stores As the chain grows, Alliance plans to continue using MCI Mail as its choice of an electronic mail system 	

7. Application Trends

Alliance Stores sees EDI applications, bar code scanning applications and Home Shopping as future applications in its niche of the retail market.

8. Most Successful Applications

For Alliance Stores, MCI Electronic Mail has been the biggest success. It has electronic mail fully installed in each store and at corporate headquarters. Alliance Stores uses electronic mail for reporting discrepancies and for receiving vendor merchandise.

Since Alliance Stores is so new, it has not had any application failures. However, it is anxious to have its Merchandise Information System fully integrated with its other corporate applications. In addition, it wants to fully use EDI technology to communicate, exchange and document information with its vendors.

9. Summary

Alliance Stores is fully committed to information technology for its growth and expansion over the next few years and to C/S technology for its rapid growth. However, they plan to completely outsource development of C/S systems.

Alliance Stores is also committed to fully using EDI technology for such vital inventory management activities as merchandise allocation/replenishment and reporting. It recognizes the valuable role EDI plays in increasing inventory turns, sales and customer satisfaction, as well as EDI's role in reducing inventory levels and operating costs. In summary, Alliance Stores no longer sees Information Technology as merely a tool for keeping pace with its rapid growth and change. IT is helping to drive its growth.

C

Bel Air Markets, Sacramento, CA (Subsidiary Of Raley's)

Bel Air Markets corporate headquarters is located at 500 West Capital Avenue in West Sacramento, California 95605. This supermarket chain is 39 years old and was founded by the Wong family in 1955. The company presently has 18 stores located throughout the Sacramento area. The company sales in FY1992 and 1993 was \$375 million. In 1992, Bel Air Markets was acquired by Raley's, a 60-store chain, located in the Sacramento, CA and Reno, NV areas. Raley's does approximately \$1.35 billion in sales, at the present time.

Although Bel Air was acquired, its operations are completely separate, except for a few centralized corporate functions that include finance and accounting, human resources, information technology, advertising and buying functions.

This survey was conducted with:

- Gordon Wong, Director of IS
- Gordon Mack, Manager of Data Processing
- Terry Tremelling, Corporate Controller

1. IS Structure

Presently, the Bel Air Markets IS organization is structured with a Director of IS, Manager of Data Processing, Store Systems Manager, Communications Manager, three programmers, a PC Manager and several data entry personnel. The Bel Air's IS Director currently reports to the CIO at Raley's Stores. Since the acquisition, the focus of IS systems development has been to consolidate critical operational applications with the Raley's applications and eliminate duplicate applications. Bel Air has traditionally developed applications in a UNIX, microcomputer environment, whereas, Raley's has traditionally developed applications in an IBM mainframe, VM environment. Both companies plan to continue, in the short run, this IS separation, except for critical operational applications. Bel Air and Raley's are just beginning to put together a five-year plan to develop and re-engineer critical applications in a C/S environment.

2. IS Consolidation

Bel Air is approximately 85% complete in transferring its accounting systems over to Raley's accounting systems. Raley's uses Millennium Accounting Software. Raley's, Bel Air Markets and Savemart own their own warehouse called "SuperStore Industries." They are in the process of merging the inventory ordering systems with these three supermarket chains for use with their wholesale warehouse.

4. Applications That Were Implemented in the Last Three Years

In the last few years, Bel Air Markets has implemented:

- Novell LAN
- NCR 2127 cash registers

- Check Authorization and Check Collection System
- ACH/EFT System
- Direct Debit EFT System
- Credit System
- Video Rental System
- Electronic Mail System
- Energy Monitoring System
- Bakery warehouse ordering
- Computer for students system (in exchange for store receipts, students get computers)

It has also installed a Verifone POS terminal, store controllers, multiplexers and leased telephone lines from each store back to corporate headquarters.

5. New Applications That Will be Implemented in the Next Few Years

Bel Air is presently implementing a labor scheduling system and plans to implement a WAN to do EDI merchandise allocation system, specifically, a merchandise inventory/replenishment ordering system. This system will be implemented on the Raley's IBM mainframe, initially, but will be moved to a C/S environment over the next five years. Bel Air also plans to implement a time-and-attendance system, shelf planning system and a price look-up, verification/price changing system. These systems will be implemented on Bel Air's HP9000 platform. Bel Air also plans to replace its store platform (286 PC Clones) with an IBM RS/6000, so Raley's and Bel Air will have the same POS and computer equipment in each store.

6. Client/Server Development

Bel Air plans to move its POS Payment Systems applications to a client/ server environment for Bel Air Stores and Raley's Stores. Both chains agree C/S technology will be their goal in the next five years, after they have reasonably consolidated their mission

critical applications. They also plan to outsource any new software development and acquire new software, rather than develop internally. They also have plans to outsource much of their maintenance.

7. Hardware, Software and Networking

Bel Air's goal over the next five years is to completely move to a C/S PC networking environment, and develop and re-engineer its systems from Raley's mainframe environment to a networked RS/6000 environment. It plans to continue with a LAN within corporate headquarters and implement a WAN for use between stores, corporate headquarters, its wholesale warehouse and suppliers.

8. IS Budget

Bel Air Markets spend approximately \$1 million annually for developing and maintaining its IS applications. Over the next few years, the store plans to annually spend 2% to 3% of total sales, to maintain and develop new systems. This IS budget is a completely separate budget from Raley's IS budget.

9. Vendors Providing Computers, Development, Systems Integration and Specific Applications

Exhibit V-1 shows vendors that supply Bel Air Markets, its products, strengths and weaknesses. Bel Air has chosen technically innovative solutions.

EXHIBIT V-2

Vendors Supplying Bel Air Markets

Vendor	Product/Service	Strengths	Weaknesses
Retail Profits, Inc.	Check Auth. & Collection ACH/EFT System Direct Debit & Credit System Video Rental System Electronic Mail System	<ul style="list-style-type: none"> Small enough so Bel Air got 100% attention System specifications custom designed Check Auth. & Collect. System saves chain millions of dollars annually Software is elegant, bug-free and modifiable, based on Oracle database 	
NCR (now AT&T GIS)	POS Cash Register System	<ul style="list-style-type: none"> Excellent POS H/W 	<ul style="list-style-type: none"> Expensive installation and maintenance
BASS	Price Look-up & Change System	<ul style="list-style-type: none"> Very accurate Software, and installation was fast & efficient System is a great time saver 	

10. Application Trends

Bel Air foresees more EDI applications for purchases and deliveries of merchandise in its future installations. With EDI installations, Bel Air will be able to eliminate the expensive and time consuming paper trail, and dramatically reduce their transaction costs and errors with suppliers.

11. Biggest Successes & Biggest Failures

Bel Air Markets Check Authorization and Collection System has been its biggest success, along with its POS Payment Systems (e.g., ACH/EFT, Direct Debit & Credit). These systems were developed by retail profits and have saved the chain millions of

dollars annually in bad check losses and have made its store's front-ends run smoothly and efficiently.

Bel Air's biggest failures are:

- Outsourcing the development of a Direct Store Delivery System. The system was never completed and was abandoned at an undisclosed cost.
- POS Lottery System. This system was originally a great success, due to Retail Profits, Inc., that developed the system for the California State Lottery. However, once the California State Lottery took over the ownership and maintenance of the system, it became impossible for Bel Air to maintain the system.

12. Summary

Although Bel Air is in the throes of merging its UNIX microcomputer software applications with Raley's mainframe applications, it is fully committed to a PC-networked C/S environment for its future development. It plans to outsource most development for rapid and efficient implementation along with a major portion of its maintenance. Bel Air is committed to using EDI technology, especially for vital inventory management applications and smooth operations, with its own wholesale warehouse and suppliers.

Bel Air has always been a technology pioneer. More than 18 years ago, Bel Air was the first supermarket chain to implement scanning technology in Northern California. Six years ago, it was the first supermarket chain to implement EFT in the Northern California area. Much of Bel Air's success can be attributed to its being fully committed to Information Technology, excellent customer service and strong management with astute foresight.

D

Fred Meyer, Portland, OR

Fred Meyer's corporate headquarters is located at 3800 South East 22nd Avenue, Portland, Oregon 97242. The Company specializes in large "Super Stores"—several stores under one roof. The stores include a grocery supermarket; home improvement; discount apparel; jewelry; record and small appliance stores, etc. The

chain operates 105 super stores and 20 to 25 standalone jewelry stores. The company sales in FY1992 and 1993 were approximately \$2.8 billion. Most of the stores are located in the Portland, Oregon area with several located in the state of Washington and one in California. During the last five years, Fred Meyer has shown a steady 5% to 10% increase in annual sales. The survey was conducted with Jack DiGennaro, Store Systems Application Development Manager.

1. IS Structure

Presently, the Fred Meyer IS Organization is centralized with a CIO, director of network services, director of store systems and a director of administrative services. The company has implemented the following:

- IBM 4680 registers in all stores
- WAN Spread Spectrum communications network
- Direct Store Delivery System (DSD)
- Check Authorization and Collection System, developed by IBM
- Quick Response EDI Merchandise Information System, developed by PRJ Associates
- Budgeting System
- Interim Ordering System

2. New Applications to be Implemented in the Near Future

Fred Meyer plans to replace the IBM ES/9000 mainframe with IBM C/S RS/6000 computers at its corporate headquarters and run RS/6000 computers in each store. It also plans to continue implementing an EDI replenishment system with all its suppliers. Approximately 25% of the company's suppliers are implemented on the Fred Meyer EDI Replenishment System. Fred Meyer also plans to implement a Warehouse Management System and a full EFT, on-line, Debit and Credit System. The company also plans to implement electronic Pricing, Frequent Shopper Coupon and Home Shopping Systems.

3. C/S Development

Fred Meyer is committed to C/S technology with a goal of having all its applications moved to a C/S environment over the next five years. The company also plans to outsource most new software development and system integration, rather than develop internally. Ninety percent (90%) of software development will be outsourced. PowerBuilder is the client/ server software tool of choice for most re-engineering and new software development.

4. Hardware, Software and Networking

As it moves to C/S applications, Fred Meyer plans to develop and re-engineer its systems from a mainframe environment to a RS/6000 environment. Plans are to continue with a WAN for use between stores, corporate headquarters, a wholesaler's warehouse and its suppliers.

5. Vendors Providing Computers, Development, Systems Integration and Specific Applications

Exhibit V-3 shows vendors that supply Fred Meyer its products, strengths and weaknesses.

EXHIBIT V-3

Vendors Supplying Fred Meyer

Vendor	Product/Service	Strengths	Weaknesses
IBM	<ul style="list-style-type: none"> • 4680 Registers • Check Auth. & Collect'n. 	<ul style="list-style-type: none"> • Excellent POS H/W • Quality installation & maintenance 	<ul style="list-style-type: none"> • Expensive installation & maintenance
Symbol Technologies	<ul style="list-style-type: none"> • Spread Spectrum WAN 	<ul style="list-style-type: none"> • Excellent WAN system • Will continue to use this WAN as its systems grow and change 	<ul style="list-style-type: none"> • None mentioned
PRJ Associates	<ul style="list-style-type: none"> • Quick Response, EDI • Merchandise Info. System 	<ul style="list-style-type: none"> • Excellent S/W and fully integrated with IBM technology 	<ul style="list-style-type: none"> • None mentioned

6. Application Trends

Fred Meyer foresees more EDI applications for:

- Purchases
- Deliveries of merchandise
- Sharing information with its suppliers

The company also sees more customer service applications such as home shopping system services and frequent shopper couponing systems as important strategic systems to keep and increase market share and revenues.

7. Applications Successes and Failures

Fred Meyer's POS IBM 4380 Systems and its Shelf Space Audit System (SPA) have been its biggest successes. The POS 4380 Cash Register Systems has provided everything needed at the front-end of its stores, and an easy environment to add additional applications that are fully integrated into the store systems environment.

The Shelf Space Audit System has been a great time and labor saver, but most importantly, has dramatically decreased inaccurate replenishment of merchandise and space allocation throughout the chain.

Fred Meyer's biggest failure has been implementing an IBM AS/400 inventory system in each store, along with AS/400 computers that have proved to be a costly hardware blunder. The computers have now been replaced with RS/6000 computers with better price/performance.

8. Summary

Fred Meyer is fully committed to Information Technology and C/S technology for its future development and focused steady growth over the next five years. Plans are to outsource at least 90% of its development for rapid and efficient implementation. Fred Meyer is committed to EDI Technology, especially for its Quick Response Merchandise Information System and smooth, accurate operations and information exchange with its wholesaler and suppliers. Fred Meyer sees "Customer Service" applications such as Home Shopping System Services and Frequent Shopper-Couponing Systems as the technology to help it increase its revenues, margins and market share by the late 1990s.

VI

Vendor Analysis

A

Survey Results

As part of the survey, respondents were asked to identify key vendors. These vendors were then given a satisfaction rating on a scale of 1 to 5, with 1 being dissatisfied and 5 being very satisfied. In addition, the proportion of their customers, who mentioned C/S as a key strategy, was estimated. Given the sample sizes are very small, these results should be used to aid understanding rather than as absolute measures. A tabulation of the major vendors identified is given, with some respondents mentioning more than one vendor. In all, there were 194 vendor mentions. Several regional, small vendors were named and many with only a single mention. Only the vendors cited more than four times are analyzed in Exhibit VI-1.

The first column gives the vendor, followed by the number of mentions, then the average rating, the percentage of customers mentioning C/S as a strategy and finally, comments raised by respondents.

EXHIBIT VI-1

Vendor Analysis

Vendor	Number of Mentions	Average Rating	Percent Migrating to C/S (%)	Notes
Apple Computer	6	4.2	50	Four respondents noted ease of use. In one case, Macs were used as clients for an IBM AS/400 server. Shelf-planning and market basket analysis are two areas where software vendors offer solutions on a Macintosh platform.
Compaq	15	4.1	27	Respondents commented on good value for money and good service.
Digital Equipment	6	3.7	67	No problems with equipment were mentioned.
Hewlett-Packard	10	3.6	40	Most of the stores had purchased HP PCs for a range of applications. Two stores had purchased laser printers that were performing well. One company with PCs and a mainframe reported reliability problems with an EDI system. A major clothing chain gave a low rating because it felt that an HP mainframe was over-priced and could not be upgraded affordably.
IBM	69	3.9	20	Systems ranged from mainframes, through AS/400s and RS/6000s to PCs. Several companies had purchased point-of-sale systems from IBM. Many customers were very satisfied. Cost of maintenance was raised as an issue, on the other hand, several respondents cited customer support as a key IBM strength. Concerns about IBM's organization such as bureaucracy and IBM's internal communications were raised.
NCR (now AT&T GEIS)	10	3.3	60	NCR is rated highly for its POS equipment, but two respondents mentioned the company was weak in support and slow to respond. Another respondent had selected NCR over IBM for a new platform for retail systems because the company appeared to understand the customer better.
Unisys	5	3.6	40	Unisys computers are being used for point-of-sale systems and also in payroll systems. Reliability is a key feature. Two respondents felt the company was slow to respond.

In general, there were many small, regional resellers implementing specific applications, such as the vendors mentioned in the case studies. Hardware manufacturers, especially IBM, still retain strong account control. There is less use of mail order and computer stores for PCs than in some other markets.

Established hardware vendors like HP, IBM, NCR and Digital Equipment are recognized as being able to supply client/server solutions. These are the vendors that have account control in retailing.

The retail market is still highly fragmented with many retailers relying on small, local, value-added resellers for customized solutions. This should provide opportunities for system integrators and solutions vendors that focus on the retail market. Any vendor entering the market needs to be aware of the tight margins and be able to sell efficiently.

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A

Appendix A Applications Details

This appendix provides definitions of all the applications identified in this study. The applications are grouped according to categories. Exhibit A-1 includes all applications unique to INPUT's definition of the retailing industry sector. Exhibit A-2 contains definitions of applications identified in this study INPUT defines as cross-industry.

A

Description of Applications

In retailing in particular, applications are being integrated to reflect business processes. Hence, ordering and inventory systems, traditionally two separate areas for a large retail chain, are being combined. Thus, the definitions in practice are somewhat overlapping. The terminology used is taken, largely, from respondents' questionnaire responses.

In the future, more applications will be integrated and it will be more appropriate to consider the entire workflow of an application, that will tend to be made from modules.

EXHIBIT A-1

Retail Trade Industry Application Types

Retail Trade Applications	Description/Examples
Distribution/Warehousing Systems	Systems that manage delivery and warehousing. Inventory and EDI systems are in separate categories, although there is significant overlap in practice.
Direct Store Delivery System	Tracks deliveries and output directly from the manufacturer and wholesaler to a store.
Distribution	Covers a range of functions such as delivery schedules, truck loading, vehicle routing, shipping, billing, inventory control, accounting.
Freight Payment	Payment system for freight and deliveries to a store.
Shipment Tracking	Tracks shipments as they are sent from warehouses to stores and also between stores.
Warehouse Management	Supports warehouse operations assisting in location decisions, shipment activity, bills of lading, physical inventory reporting.
Electronic Commerce	General-purpose systems to support Electronic Data Interchange.
EDI Systems	Systems that use the EDI format for transferring electronic documents.
Electronic Fund Transfers (EFT)	These are systems that transfer funds electronically to another account using a switch (e.g., Interlink, Star, etc.) or Automated Clearing House (ACH). The systems may be online, meaning the transmission takes place in real time or offline when the transmissions are sent as a batch.
Electronic Payments	Allows customers a choice of payment methods (e.g., check, debit, credit, etc.)
Quick Response System	A system for ordering goods on an "as needed basis." When inventory runs low, goods are ordered according to pre-determined business rules using EDI.
Vendor Interface	Any system that interfaces with a vendor's system.

EXHIBIT A-1 (Cont.)

Retail Trade Applications	Description/Examples
Inventory	
Inventory Systems	Any system that tracks inventory, whether in a store or in a warehouse. For example, a MRP II (material requirements planning II) system is an inventory system.
Perpetual Inventory	An inventory system that is continually updated.
Rotating Inventory	A system that enables retailers to move and rotate inventory between stores for rapid turnover.
Marketing Systems	
Consumer History	Shows consumer records with history of purchases, good and bad credit information, mailing list information.
Coupons	Manages coupon reimbursement, tracks coupons, disburses coupons to customers.
Customer Demographic Database	Analyzes demographic shopping patterns of customers.
Home Shopping	Takes orders from customers via remote communications (phone, written order, TV, PC using modem), tracks orders, payments and order fulfillment.
Merchandise Information	Provides executives with information on how merchandise is moving, where it should be located in a store, how many returns, key supplier and merchandise ordering, receivables and payment information.
POS Payment Systems	
Check Authorization and Collection	Checks consumers' credit based on checking payment history.
Credit Card System	Any system for processing customer credit payments.
Credit Checking System	Checks consumers' credit for a variety of credit cards (e.g., Visa, Mastercard, Discover etc.)
Point-of-Sale Payment	System that manages the cash register and pricing and tracks consumers' payments.

EXHIBIT A-1 (Cont.)

Retail Trade Applications	Description/Examples
EFT Direct Debit System	Debits customer's checking account - online.
EFT-ACH Debit System	Debits customer's checking account - offline.
Purchasing	
Ordering	Order entry, may be part of an accounting system and Merchandise Information System. Typically tracks orders, may or may not use EDI to connect to systems.
Purchase Tracking	Part of Merchandise Information System
Purchasing	Systems to order and track purchases. Part of Merchandise Information System.
Replenishment Systems	Systems that order goods as inventory levels fall. Perpetual inventory systems make decisions based on merchandise information.
Store Systems	
Bar Code - Scanning	Bar code scanning may be undertaken for inventory tracking and also at the point-of-purchase for reading prices from UPC codes.
Energy Monitoring	Monitors energy use, from heating and lights to refrigerators. May also include security system.
Integrated Store Systems	These combine many functions required in a retail store, point-of-sale systems.
Portable Label Printing System (Universal Product Code)	Systems for marking goods with UPC bar code labels. Used in supermarkets for pricing.
Price Look-up & Verification	System for looking up price of goods.
Price Changing	System for changing the price of goods.
Scales Management	System for managing scales in a supermarket, where different goods have different prices per lb. and prices are pre-entered into the system.
Shelf Planning System	Plans the layout of goods on the shelf.

EXHIBIT A-1 (Cont.)

Retail Trade Applications	Description/Examples
Store Cash Register Systems (ECR Systems)	Systems to manage store cash registers and point-of-sale terminals.
UPC Item File Maintenance System	Maintains a database of UPC codes.
UPC Item Marking System	Marks items with UPC codes.
Video Rental System	System enabling consumers to check out videos, keep track of video inventory and return dates for stores that rent videos.

EXHIBIT A-2

Cross-Industry Application Types by Category

Application Category/Type	Description/Examples
Cross-industry Financial	
Accounts Payable/Receivable	Traditional systems to handle invoicing and payments and manage receivables.
Cost Accounting	Systems to analyze the costs of goods and services.
Financial Reporting	Financial systems for the generation of management info.
Fixed Assets	Systems to track the book value and depreciation of assets.
General Ledger	General ledger.
Integrated Financial Systems	Integrated accounting modules with reporting.
Other financial	Foreign exchange; Banking Reporting Systems.
General Infrastructure	
Database Conversion - General	Migration to a new database architecture.
Database Conversion - Relational/Distributed	Migration to a relational or distributed (or both) architecture.
Data Conversion	Projects to convert the data from one database environment to another.
Hardware Upgrades	Projects to upgrade or migrate to new hardware.
Imaging Systems	Installation of infrastructure to support imaging applications.
Operating System Upgrades	Operating system upgrades.
Platform Migration - C/S	Projects to upgrade or migrate to new client/server hardware.
Platform Migration - General	Projects to upgrade or migrate to new general purpose hardware or networks.
Human Resources	
Human resources information system	Human resources information system, HRIS.
Payroll	Payroll processing.
Benefits Administration	Manages employee benefits.

EXHIBIT A-2 (Cont.)

Application Category/Type	Description/Examples
Office Systems	
Electronic mail and messaging systems	Electronic mail systems.
Word Processing Systems	Installation of applications that use word processing.
Planning and Analysis	For this application, the spreadsheet applications were combined with office systems.
Financial Modeling	Systems to support financial business modeling and analysis.
Spreadsheets/Databases	Applications that use desktop spreadsheets and databases.
Telecommunications	
Voicemail	Voicemail systems.
Other	
Computer-aided drafting	Drafting system for designing a new store.

(Blank)

B

Appendix B Questionnaire

A

Questionnaire for Retail Trade Case Studies

I. General Information

1. Company: _____
2. Address:

3. Total sales this fiscal year: _____
4. Growth over past 5 years—% of Market company owns - Locally? Nationally?
5. Respondent(s)

Name:

Title:

Phone/ext.:

II. Specific Retail System Information

1. What is your company IS (or MIS) System organization structure?

e.g., (1) Corporate Central IS

(2) Divisional System IS

(3) Communications & Network Services**(4) Store Systems****(5) Other**

2. Which new applications have you implemented in the last five years?
3. Which new applications do you plan to implement in the next few years?
4. Of these applications, which organization has/had the primary responsibility for the project/application installation?

Corporate IS User Management Other
 Divisional IS Store Systems

5. Which applications do you plan to re-engineer or replace in the next five years?
6. Which applications involve EDI/Network linkage with customers, suppliers or others outside?
7. Do you have plans to develop or move mission-critical applications to client/server?

If yes, which applications are most critical and in what time-frame do you foresee making the transition for each system or application?

8. Which applications have already/or are in the process of moving to client/server?
9. To what degree are you looking to outside vendors for products and services? (%)
10. What applications or developments are you planning to outsource, and from which vendors are you evaluating for these applications or development?

Packaged software:

Systems integrators:

Other professional services:

11. What platforms are most likely to be used? (H/W, Op. Systems)
12. Are you planning to use client/server tools for your development? If so, which tools? (PowerSoft? Gupta? Other?)
13. What is your total budget for systems this year, and over the next several years?

14. What is the expected cost for each application you are planning to implement or re-engineer?

15. What vendors have been providing you with computers, systems integration, applications, etc.?

Vendor

Product/Service

Strength/Weaknesses

16. Which applications involve EDI/Network linkage with customers, suppliers, wholesalers, others outside?

17. What applications trends do you see coming in retailing over the next 2 to 5 years? (e.g., Home Shopping? Virtual Inventory? etc.)

18. What applications have been your biggest successes and which ones have been your biggest weaknesses?

19. Which applications provided you with the biggest return on investment, and which ones did not provide the expected return on investment?

(Blank)

C

Appendix C Vendors

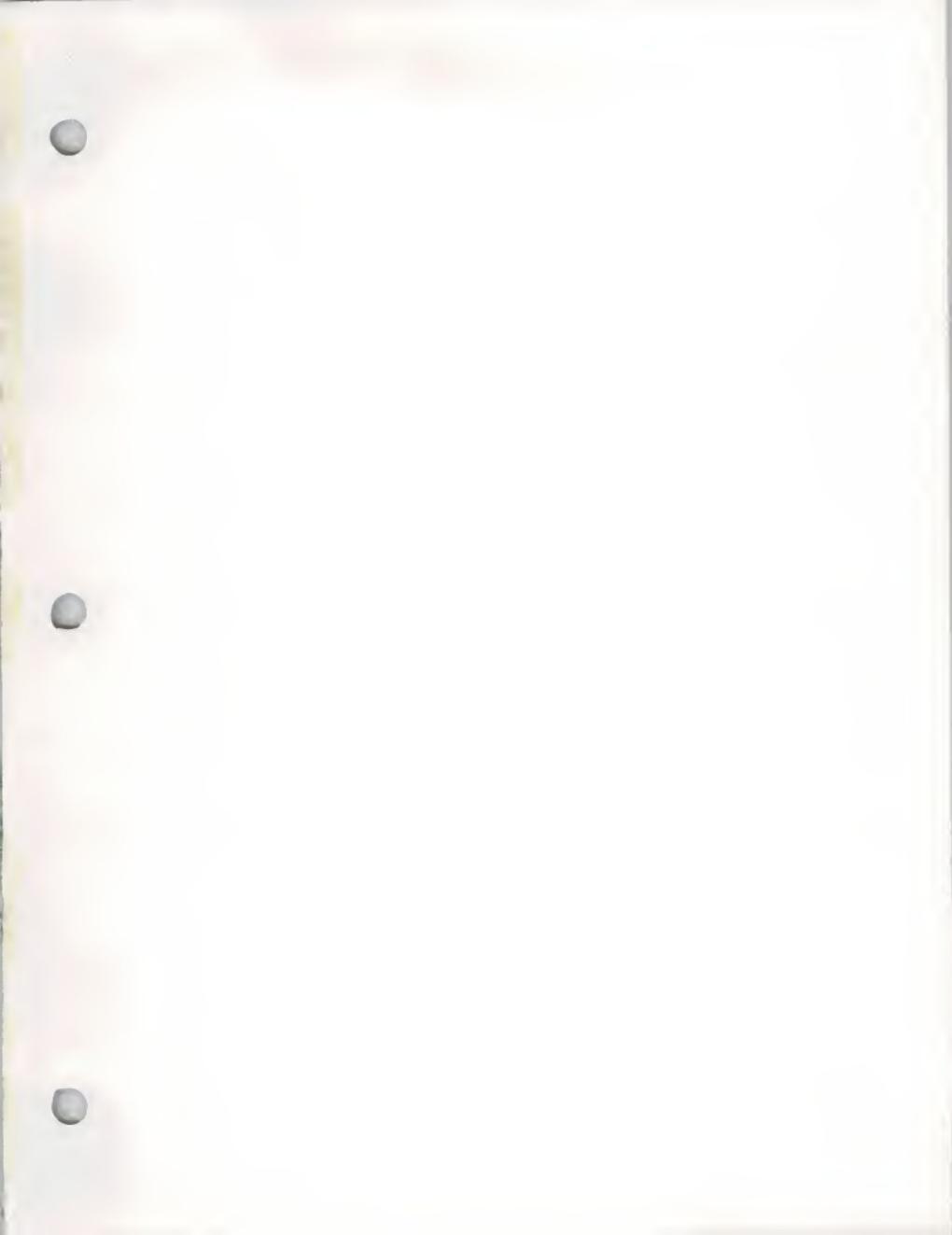
This section gives the names and addresses of vendors mentioned in the report.

EXHIBIT C-1**Vendor Addresses**

Vendor	Address
Apple Computer, Inc.	20525 Mariani Avenue Cupertino, CA 95014 Tel: (408) 996-1010
Compaq Computer Corp.	20555 SH 249 MO 040514 Houston, TX 77070 Tel: (713) 370-0670 Fax: (713) 374-1740
CompUSA	See local yellow pages for nearest store
Data General Corp.	4400 Computer Drive Westborough, MA 01580 Tel: (508) 848-5000
Digital Equipment Corporation	146 Main Street Maynard, MA 01754 Tel: (508) 493-5111 Fax: (508) 493-8780
Dell Computer Corp.	9505 Arboretum Blvd. Austin, TX 78759 Tel: (512) 338-4400 Fax: (512) 728-3653
Gateway 2000	610 Gateway Drive North Sioux City, SD 57049 Tel: (605) 232-2000

EXHIBIT C-1 (Cont.)

Vendor	Address
Hewlett-Packard Co.	3000 Hanover Street Palo Alto, CA 94304 Tel: (415) 857-1501 Fax: (415) 857-5518
IBM	Old Orchard Road Armonk, NY 10504 Tel: (914) 766-1900 Fax: (914) 765-6021
NCR Corp.	1700 S. Patterson Boulevard Dayton, OH 45479 Tel: (513) 445-5000 Fax: (513) 445-4184
Sun Microsystems, Inc.	2550 Garcia Avenue Mountain View, CA 94043 Tel: (415) 960-1300 Fax: (415) 969-9131





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- Acquisition targets

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- Peer position

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**Client/Server Markets and
Applications Program**

***Client/Server Applications Trends—
State and Local Government***

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I

Introduction

This report analyzes trends in client/server (C/S) applications in the telecommunications market segment. It is the sixth in a series of vertical market reports produced as part of INPUT's Client/Server Markets and Applications subscription service.

A

Objectives

Based on a user survey, this report addresses the following issues regarding the telecommunications sector:

- To what degree is the industry migrating to client/server architectures?
- Which applications are likely to be targeted for implementation over the next two years, and which are headed for a downsized client/server environment?
- Who is managing implementation or conversion of client/server applications? The central information systems function (IS), end-user management, its local IS function, or third parties?
- To what degree are industry participants looking to outside vendors for products and services?

B**Scope**

The analysis focuses on the telecommunications industry sector within the United States. This particular study surveys 37 companies, some with multiple major subsidiaries or divisions. The number of entities interviewed was 116. The breakdown of these entities and SIC (Standard Industrial Classification) codes are listed in Exhibit I-1.

Most telephone companies have separate information systems (IS) organizations for administrative staff support and telephone operations support. Administrative systems include human resources, accounting and marketing support. Telephone operations include billing, customer service, network operations support and switching support. In addition, directory services may be supported by other IS groups. This report does not differentiate between the various IS departments found in telephone companies.

EXHIBIT I-1**Telecommunications Respondents By Industry Sector**

Code	Description	Number of different entities	Percentage of entities
481x	Telephone Communications	78	67
483x	Radio and Television Broadcasting Stations	15	13
484x	Cable and Other Pay Television Services	18	16
489x	Other Communication Services	5	4

C**Methodology**

Data for this analysis are taken from INPUT's applications database and built from telephone interviews that took place throughout 1993. Respondents identified 150 applications or

projects they would be implementing over the next two years using their own terminology, rather than using a predetermined set of definitions. Once the survey was completed, INPUT analyzed the 150 project descriptions and coded them into nine application categories.

Exhibit I-2 lists telecommunications applications by category, plus an additional four categories typically found in telecommunications. This report analyzes telephone Customer Support Systems and Operations Support Systems (OSSs). In the INPUT definition of Customer Support Systems, besides customer service and customer records systems, billing, directory assistance and operator support systems have also been added. Operations support systems may be divided further into facilities management, transmission, switching and outside plant.

Other categories like Directory Management, Regulatory Systems and Information Services were not mentioned in the interviews. They are included in Exhibit I-2 because they are other areas where client/server technology can be successfully used in a communications company. In addition, systems development for telecommunications systems creates another applications category, Systems Research and Development. Many of the systems used in this area are found in AT&T Bell Laboratories, Bell Communications Research and GTE Laboratories. Detailed descriptions of each application type are contained in Appendix A.

The sample size is relatively small compared with the size of the market. Graphs and charts are provided to supplement intuition rather than as a statistically rigorous analysis of the market that would have required more interviews.

EXHIBIT I-2

Definition Of Telecommunications Applications Categories

Application Category	Application Type
Telecommunications Applications	
Customer Support Systems	Billing, Customer Records, Customer Service, Directory Assistance, Operator Support
Operations Support Systems	Facilities Management, Inventory, Loop Maintenance, Materials Management, Mobile Craft Support Systems, Network Monitoring, Network Routing, Remote Switching Center Control, Repair Scheduling and Routing, Repeater Management, Service Orders, Service Quality Monitoring & Reporting, Software Defined Networks, Switching Center Maintenance and Monitoring, Switching System Support, Transmission Systems, Work Order Tracking
Directory Management	Yellow, White and Blue Pages Systems Management, Yellow Pages Advertising Support
Regulatory	Pricing of Regulated Services, Regulatory Filings and Tariff
Information Services - Messaging, On-line Databases, Video	Public Electronic Messaging Services (Consumer and Commercial), Information Databases, Video Services
Systems Research and Development	Service Requirements Planning, Systems R&D
Cross-Industry Applications	
Financial	Accounts Payable/Receivable, General Ledger, Integrated Financial Systems, Investment Management, Property Management, Shareholder Services, Treasury Management
Human Resources	Applicant Tracking, Benefits Administration, Labor/Job Scheduling, Management Development, Payroll, Time and Attendance
Infrastructure	Hardware, Software & Network Upgrades
Office Systems	Electronic Mail & Messaging, Desktop Publishing, Integrated Office Systems and Word Processing
Planning & Analysis	Decision Support Systems, Executive Information Systems, Project Management, Spreadsheets
Sales & Marketing	Market Forecasting, Market Research Support, Sales Force Automation, Sales Tracking, Telemarketing
Cross-industry Other.	Help Desk (internal), System Administration, Voice Mail, Voice Response

D

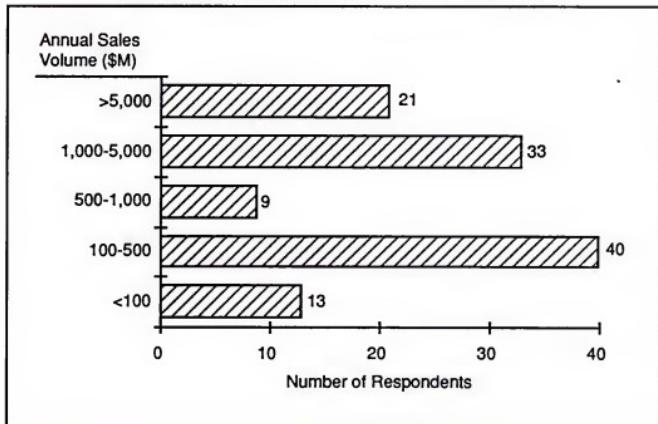
Characteristics of the Sample

1. Sample Demographics

Exhibit I-3 shows how the companies are distributed according to annual fiscal year 1992 sales.

EXHIBIT I-3

Distribution of Respondents by Sales Volume



Companies surveyed have an average annual sales volume of \$2,930,000. The institutions are grouped into five size categories:

- Very Large – Greater than \$5 billion in annual sales
- Large – Between \$1 billion and \$5 billion
- Medium – Between \$500 million and \$1 billion
- Small – Between \$100 million and \$500 million
- Very Small – Less than \$100 million

Also, the average number of employees is approximately 29,600.

2. Characteristics of Survey Respondents

User managers with direct responsibility for line or staff operations in a functional area other than information systems responded to a questionnaire. Respondents occasionally referred interviewers to the IS organization. Consequently, respondents, whose distribution is shown in Exhibit I-4, include:

- Line Manager – A manager/executive responsible for line operations at a corporate, store or divisional level; e.g., vice president of operations, vice president engineering, director of product distribution, etc.
- Staff Manager – A manager/executive in charge of staff operations at a corporate or divisional level; e.g., vice president of human resources, chief financial officer, or director of purchasing.
- IS Manager – A manager/executive whose primary responsibility is the management of information systems activities at a corporate or divisional level.

EXHIBIT I-4

Job Classification of Respondents Telecommunications

Job Classification	Proportion of Respondents (%)
Line manager	23
Staff manager	54
IS manager	23

Staff managers represent finance, distribution, inventory, marketing, operations, human resources and warehousing.

 E

Organization

The remainder of the report is organized into five chapters:

- Chapter II – *Executive Overview*, summarizes the findings of this study. It provides recommendations for both vendors and purchasers of C/S systems.
- Chapter III – *Applications Analysis*, discusses the key applications that will undergo conversion or re-implementation by telecommunications firms over the next three years. It addresses:
 - Trends in telecommunications applications
 - Leading issues
 - Analysis of the applications by application category
 - Where client/server systems are being installed
 - Target platforms and platform combinations
 - Anticipated changes in the system environment
- Chapter IV – *Management and Budgets*, analyzes who will manage the projects and the size of their budgets. It discusses:
 - Project management and control strategy
 - Outside resources
 - Near-term expenditures for applications development
 - Growth rates for budgets
- Chapter V – *Telecommunications Application Case Studies*, describes client/server implementations in representative industry applications.
- Chapter VI – *Vendor Analysis*, reviews respondents comments on leading vendors and identifies technology vendors that are supplying solutions for the telecommunications market.

F

Related Reports

INPUT has published other reports in the telecommunications market that complement this report:

- *Telecommunications -Vertical Market Analysis*
This report focuses on the identification of key changes in the market for information services in the telecommunications industry and provides general industry statistics and trends. It addresses industry convergence issues between carriers, cable TV companies, and wireless entities including the implications to information services market delivery modes.
- *U. S. Network Services Market*
This report targets network applications including EDI, e-mail, VANs (Value-Added-Networks), and Electronic Information Services including on-line databases and news services. The report assesses trends and issues affecting this market.

II

Executive Overview

This chapter summarizes the key findings in the report.

- Section A provides a brief overview of the industry and C/S potentials
- Section B discusses the key findings
- Section C provides key statistics
- Section D makes industry recommendations
- Section E addresses conclusions

A

Background

The way in which goods and services are provided is changing in telecommunications and cable TV companies. This means that the internal business processes are also undergoing significant changes. These changes are attributable to several factors:

- Convergence in the telecommunications industry of:
 - Telephone companies
 - Cable television companies
 - Wireless companies
- Convergence of telecommunications and computer technologies
- Deregulation of the telecommunications industry
- Rapid competitive exploitation of new technologies and services

The local and long distance common carriers are converging with the cable television industry. This convergence began in 1992 as a result of several activities. The Regional Bell Operating Companies (RBOCs) and other local exchange carriers (LECs) have been under pressure from long distance companies who want to participate in the lucrative "local" long distance marketplace. In addition, these long distance companies—or Inter-exchange Carriers (IXCs)—are paying LECs 45 cents of every long distance dollar for "local access" to the consumer's telephone.

IXCs are continuing to look for ways to directly access the end users and circumvent access charges. They influence regulatory agencies by challenging the validity of access charges. In contrast, these access fees make up a significant part of a local exchange carrier's revenue stream.

In 1983, a decree from the Justice Department dictated that the Bell System would be divided into seven regional entities called Regional Bell Operating Companies (RBOCs). AT&T was allowed to continue to offer long distance services and manufacture equipment. As a result of this decree, RBOCs were prohibited from providing long distance, manufacturing equipment, and providing content-based information services. However, a ruling in 1992 now allows the RBOCs to offer information services.

Small, privately held companies called competitive access providers (CAPs) have begun to appear in larger metropolitan areas. Using fiber optic cabling and some microwave technologies, CAPs have begun to challenge the RBOCs and local operating companies for commercial business.

The cable television (CATV) industry has been essentially unregulated (on a national basis) since 1986 and is now approaching market saturation in the home consumer marketplace. Consumers have become increasingly unhappy with CATV services. Prices have continued to edge up over the years with only limited controls from local city governments. Customer service levels have become increasingly unsatisfactory as well. As a result, the public is pressuring Congress and the FCC to get back in the business of CATV regulation. Regulatory controls have now been put in place that require certain degrees of accountability, and have caused a 17% rollback in consumer prices.

The cellular telephone industry has also been evolving since 1986. This industry has demonstrated significant growth even though it has remained under FCC regulation. While its prices are two to three times higher than traditional phone service, it has recently been growing at 40% per year. Note that the FCC stipulated that each metropolitan and rural service area have a "duopoly" market structure—a minimum of two cellular service companies per service area.

Recent and rapid technology changes have introduced new potentials for the telecommunications and computer industries in the entertainment industry. Video-on-demand, interactive multimedia, high-speed information transfer, on-line directory, imaging, portable terminals, intelligent messaging and voice mail—all require some form of enhanced telecommunications.

From a broader perspective, there are several other forces that are currently influencing and taking advantage of these telecommunications industry changes. In recent years, the basic tenets of business operation have been modified to accept new concepts such as total quality management and just-in-time (JIT) production to meet a more competitive and global environment. These modifications in how business is performed now place additional impetus on the evolution of the telecommunications/technology convergence.

As part of this "evolution," Congress is in the process of re-writing the Telecommunications Act of 1984. The specifics are still unclear, but it looks very probable that a competitive, free market approach will replace a significant amount of regulation. While certain regulatory guidelines must continue to prevail in order to maintain standards, resource management of spectrum, and control of national security, lawmakers are reviewing the benefits of regulating these industries through market cross fertilization.

This cross fertilization of markets should result in local telephone companies being able to manufacture equipment, provide long distance service, and compete in the cable TV marketplace. Keeping with the cross-fertilization philosophy—cable TV companies will be able to provide telephone services in the local telephone marketplace.

So where does client/server technology fit in these developments? C/S architectures are especially suited to telecommunications applications because they:

- Enhance customer service by enabling operators to access multiple databases simultaneously
- Integrate operations support systems to reduce the number of support staff required
- Leverage the considerable investment in existing operations support systems for loop maintenance, inventory, workorder tracking, network operations, switching and customer operations
- Support all forms of transmission media including data, voice, video, and image
- Simplify the maintenance of complex systems

C/S architecture is a computer technology that facilitates, in many positive ways, the new and evolving world of telecommunications.

B

Key Findings

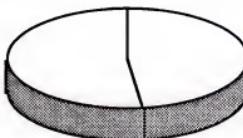
The migration to client/server architecture appears destined to achieve very high penetration rates within the telecommunications industry. As noted in Exhibit II-1, 48% of the respondents to INPUT's questionnaire said that C/S technologies will play a significant role in their architectural plans.

Exhibit II-1

Planned C/S Technology Penetration

Other Non-C/S Applications
52%

C/S Applications
48%



Several applications categories have over 50% of new systems being implemented using a C/S architecture, namely:

- Financial
- Infrastructure
- Telecommunications Operations Support
- Telecommunications Customer Systems
- Human Resources

Between 25% and 50% of other applications will be implemented as C/S. This wide acceptance of C/S is attributable to the early beginnings and subsequent development of UNIX technology within the telecommunications industry. The higher than average understanding of networking found in telecommunications system development organizations means that operations support systems have been networked for many years. Greater productivity and superior customer service result from combining multiple applications on a single windowed workstation. Telecommunications companies, with massive customer support staffs, were some of the first to realize these benefits of C/S technology.

Respondents were asked which platforms they were most likely to use for applications undergoing major changes. They indicated that 72% of applications will use a LAN as part of the installation, whereas only 54% of applications will use mainframes.

C

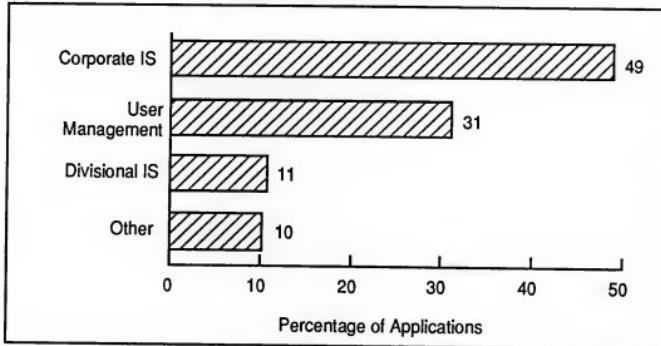
Key Statistics

From the perspective of company size, large companies with \$1 billion to \$5 billion in revenues are planning to commit 54% of their applications to C/S technologies. Both very large companies (above \$5 billion) and medium size companies (\$500 million to \$1 billion) shared a 50% application commitment to C/S technologies.

Corporate IS handles a majority (49%) of the client/server project management duties while divisional IS manages only 11%. Users manage 31% of these projects as noted in Exhibit II-2.

Exhibit II-2

Project Management for C/S Applications



Respondents were asked to identify which outside products and services they plan to use in implementing C/S systems. Of the total applications:

- 24% will use outside services
- 33% will use packaged software
- 21% will use systems integrators

D

Conclusions

With 48% of all applications being planned for client/server platforms, one can expect a very high penetration of this technology in the telecommunications industry. C/S architecture lends itself to many of the new services being developed in support of the "information highway" and interactive video. These technologies support all forms of media including voice, data, video, and image.

The major opportunities for client/server systems are in:

- Operations support systems
- Systems to support new services

Telephone industry computer systems have always been relatively complex, even during the era of mainframe solutions. C/S architecture heightens the complexity, leading to a strong acceptance of object-oriented client/server development tools. Object-oriented approaches to client/server systems reduce the complexity. C/S systems will overcome current interconnectivity problems and should become a timely and welcome asset for telephone, cable TV, and wireless companies.

E**Recommendations**

- **Software Vendors** — Software vendors should find the telecommunications industry a very receptive market for C/S. However, telecommunications companies are cautious buyers and vendors will need patience. Common carriers have been dealing with C/S solutions longer than any other industry. They understand network management. They do not have to be convinced of the value of this technological solution. Application areas destined for C/S solutions include engineering, directory services, logistics, EDI and customer service. In addition, large-scale video-on-demand systems are already under development. (See Chapter VI, Vendor Analysis)
- **System Integrators** — While systems integrators had the lowest potential use of all outside products and services (21%), they will be able to capitalize on some of the problems and issues associated with C/S solutions. In the telecommunications market, system integrators with industry expertise such as GTE, CBIS and Bellcore, present formidable competition for the technology vendor.
- **Outside Services Vendors** — Twenty-four percent (24%) of the new applications will be implemented using outside processing services. However, 50% of C/S applications will be implemented using outside services. C/S systems require significant resources and expertise — home telecommunications and cable companies are looking for external resources.

Until recently, it was anticipated that processing services were needed to support the numerous smaller carriers that were too large to be able to meet their internal needs with workstations and PCs, and too small to have large information systems organizations. Scalable C/S solutions mean that system integrators will be able to serve both large and small vendors with similar solutions. The small vendor will be able to have powerful support systems on low-cost hardware. This makes the processing services vendors vulnerable.

A good example of these transitional pressures can be seen in the cable TV industry. Many CATV entities have relied on outside processing services to support their billing and operational activities. Pressure is now on the traditional suppliers of these services to come up with C/S alternatives or their clients may seek their own solutions. Also, some of the larger CATV conglomerates have been talking about bringing processing services back in-house. Some of this decision process is driven by the convergence issues mentioned earlier.

Traditionally contract programmers have been hired for major telecommunications projects. In particular, programmers with telecommunications and object-oriented expertise are in demand for network management. This trend is likely to continue.

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III

Applications Analysis

This chapter analyzes telecommunications applications in detail. It contrasts C/S applications with non-C/S applications.

- Section A discusses leading trends in telecommunications that affect the implementation of C/S systems.
- Section B discusses leading IS issues as reported by respondents.
- Section C discusses C/S applications. It estimates the percentage of new systems that will be implemented using a C/S architecture and describes opportunities for C/S applications.
- Section D reviews a detailed breakdown of data collected
- Section E discusses target platforms, i.e. mainframe, minicomputer, or LAN.
- Section F discusses C/S implementation by size of company

A

Telecommunications Applications Trends

With the convergence of telephone carriers (telcos), cable TV companies, and wireless communications providers, one can expect a great deal of re-thinking about how systems can provide more effective support over the current architectures.

Convergence is also taking place on another level as the computer industry seeks to carve out a much larger share of the exploding telecommunications markets.

Re-regulation will play a great part in how these markets evolve over the next 10 to 20 years. It now appears more likely that Congress will decide in favor of allowing free markets to regulate these industries. These events should translate into telco carriers being able to manufacture equipment, provide long distance service and compete in cable TV markets.

The cable TV industry will also be able to compete in what were traditional telco markets, even though the FCC recently placed upwards of a 17% cost of services cutbacks on an industry that has not been regulated by this agency since 1986. However, these cuts are seen as a relatively short-term impairment to the overall viability of a competitive market structure.

INPUT believes the following key trends will shape the telecommunications IT development and implementation in the next few years:

- Convergence of telecommunications and cable TV industries
- Deregulation
- Customer service
- Billing
- Video servers
- Telecommuters/home office
- Mobile users

Competition continues to heighten in the video server arena. Telephone and cable TV companies want to position themselves to control the flow of video and data through larger databases such as Oracle (with or without nCube hardware) providing video-on-demand (VOD) to the consumer marketplace.

The convergence of computers and telephones means that the basic consumer communications device is changing. The PBX is already a LAN component in some companies and headsets connected to desktop computers replace the phone. As computer systems become 100% reliable they will tend to replace the PBX as it is known today. Software that integrates desktop messaging, fax, voicemail and phone management is already transforming

the way that phones are used in the office. Home phones are expected to become more like computers.

Phones are also becoming more mobile as personal communicators that combine wireless communications, electronic mail, calendaring and fax penetrate the market. Wireless telephones will become the norm. Satellite systems, such as Motorola's Iridium venture and Globalstar L.P., will pave the way for wireless global communications services. Competition between low earth orbit (LEO) systems will intensify in the next ten years.

Customer service systems will continue their importance in supporting and responding to competitive environments. Companies are discovering that advanced customer service organizations provide value, not only to their customer base, but to their internal production and inventory control by generating just-in-time (JIT) statistics.

Billing systems will need to become more sophisticated as services are combined under one roof. A single bill for telephone, facsimile, video conferencing, cable TV and mobile/portable wireless services will attract consumers. There will be a war among service providers to own the customer.

The home office is becoming a more attractive work place option as computer architectures become more flexible and communications costs come down. This telecommuting trend becomes even more attractive when coupled with the environmental pressures to reduce pollution. While there are still the traditional management issues including the ability to work alone with less supervision, telecommuting will become even more viable as interactive video media services are delivered to the home. Another telecommuting concept gaining acceptance is that of the regional telecommuters' office. This supports telecommuters from multiple businesses. The benefits to telecommuters are that they have a shorter commute, meet other colleagues and get away from domestic distractions.

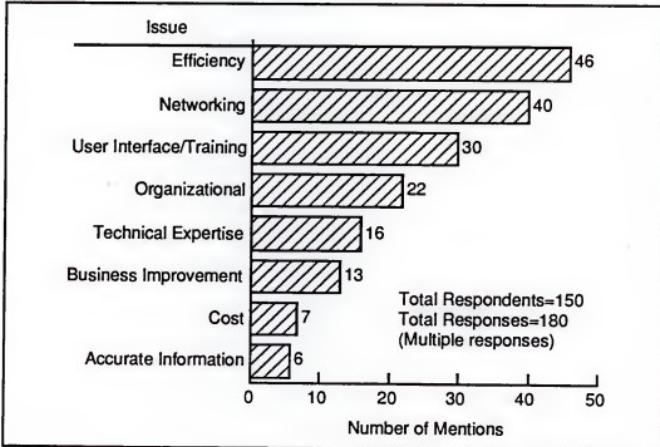
Voice and data mobile systems are growing at a substantial rate. Cellular networks were originally designed to support voice traffic using analog technology. Major conversions to digital technologies that are better suited to support data transmission are slated for roll-out toward the end of this year. It should also be

noted that the development of standards in telecommunications and computing will play a very important role as this industry evolves.

B**Leading IS Issues and User Concerns****1. Ranking of Leading IS Issues**

When asked to identify the major issues relevant to IS in the next two years, 116 respondents gave free-form answers that were coded by INPUT. Some respondents gave multiple answers and others gave none, resulting in 180 responses tabulated in Exhibit III-1.

EXHIBIT III-1

Major Information Systems Issues

As shown in Exhibit III-3, the most frequently mentioned IS issue (46%) was the need for greater efficiency relating to:

- Timeliness
- Performance
- Accuracy
- Productivity

About 42% of the respondents cited networking issues. Major concerns were interconnectivity, integration, and standards.

User interface/training and organizational improvement were also fairly significant issues. Telecommunications companies have had a long tradition of retraining employees to adapt to new technology. Client/server systems afford vendors of training services that can understand telecommunications systems an excellent opportunity.

Two-thirds of the respondents were concerned about efficient, interconnecting networks, which provide a strong user focus. Requirements include seamless integration and intuitive interfaces to networks. Telecommunications and cable companies are battling for the consumer. Those that are able to offer the easiest user interfaces with powerful access to a range of services will be the leaders. There will be a demand for third-party software vendors that can provide applications that are simple to understand and that can access multiple networks without user intervention. Internally for network management, trouble shooting and system design, simple user interfaces are needed that can support network management systems that send agents across different network topologies and equipment.

C

C/S Applications

1. C/S Penetration by Application Category

C/S systems will achieve high penetration rates in telecommunications over the next few years. Respondents were asked to identify if they were using or planning to use C/S systems. Exhibit III-2 shows the number of applications surveyed in each of the applications categories given in Exhibit I-2. It also shows the number of those for which the respondent indicated that the

C/S will be a major strategy. Forty-five percent of the respondents indicated that C/S will play a significant role in their systems architecture plan.

Exhibit III-3 takes the same data as Exhibit III-2 and expresses C/S penetration as a percentage of systems installed for each application category. The application categories are then ranked according to the percentage of systems that are migrating to C/S architectures.

EXHIBIT III-2

Planned Application Changes and Use of C/S by Category

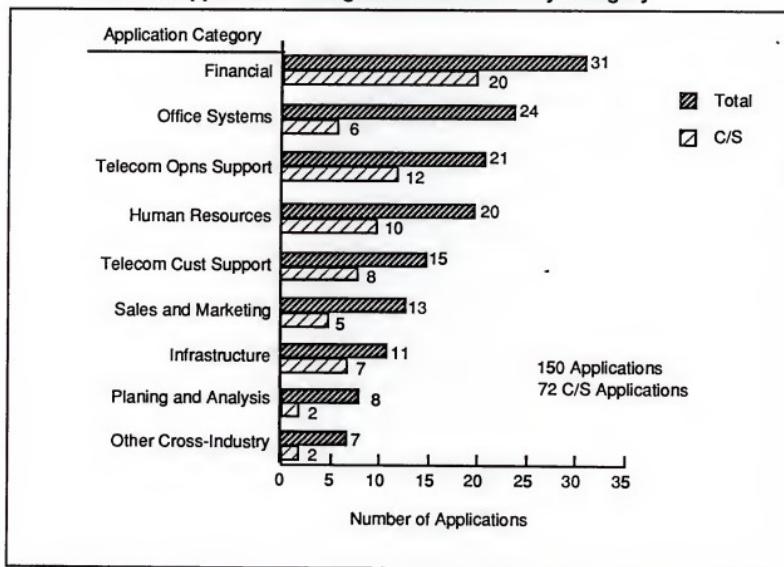
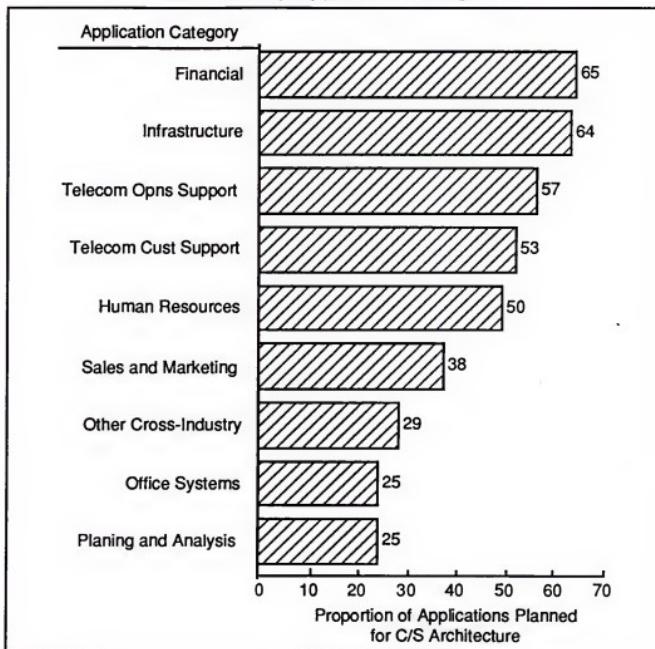


EXHIBIT III-3

Use of C/S by Application Categories



According to the survey, 48% of telecommunications applications are moving to C/S architectures. Financial applications are a key area for client/server computing with 65% being implemented using a C/S architecture. Almost all financial accounting software package vendors provide some support for C/S, as reflected in the survey.

Several respondents mentioned that they were upgrading their servers and PCs/workstations to support C/S architectures. A few respondents mentioned that they were migrating from minicomputers to PC LANs that could access mainframe data. One respondent was adding fax capabilities to mature mainframe applications using a C/S architecture.

OSSs typically connect multiple computing platforms, hence the high penetration (57%) of C/S applications. Whereas in the past, telephone company support staff may have 3270-compatible terminals for mainframe access and ASCII terminals for minicomputer access—these can be replaced with an X-Windows or MS-Windows client PC/workstation. Network management operations support systems are an area where object-oriented C/S systems are growing.

Customer support systems are another area of interest for client/server implementation, with 57% of systems moving to a C/S architecture. This is an area where UNIX workstations are proving popular, because they are compatible with existing UNIX servers and they are more robust than MS-Windows PCs for time-critical customer inquiry systems that access multiple databases. Directory assistance systems have long used database architectures that offer high performance. Indeed, some of the original back-end database machine research that led to C/S databases, was undertaken to support directory assistance systems.

D

Breakdown Of Survey Data

Exhibit III-4 gives a detailed breakdown of the data collected. It shows for each category the number of applications surveyed in the category, the strategy, the main platforms used and major resources used.

EXHIBIT III-4

Applications Group Summary Report

APPLICATION CATEGORY	No. Apps	Strategy		Primary Platform			Resources							
		C/S	Downsizing	C/S or LAN	Mini	Mainframe	Corp IS	Divl IS	User Staff	SI	Other Outside Svcs	Packaged SW	Using EDI	Outsourced
All Applications														
Financial	31	20	11	13	5	15	23	12	14	5	12	17	8	2
Human Resources	20	10	3	6	5	11	14	5	6	8	9	11	8	0
Infrastructure	11	7	3	8	1	1	6	3	7	3	5	8	4	1
Office Systems	24	6	4	17	2	7	12	4	12	9	5	15	6	6
Planning & Analysis	8	2	2	6	1	2	4	2	1	2	3	4	1	0
Sales & Marketing	13	5	3	12	2	3	4	5	4	4	4	7	5	1
Cross-Industry Systems	7	2	1	2	2	1	6	1	3	1	3	5	1	1
Telecom Customer Systems	15	8	3	4	2	10	13	9	10	5	6	10	7	1
Telecom Operations Support Systems	21	12	6	4	7	4	13	9	15	9	10	10	9	4
TOTAL - All Applications	150	72	36	72	27	54	95	50	72	46	57	87	49	16

EXHIBIT III-4 (Cont.)

Applications Group Summary Report (Continued)

APPLICATION CATEGORY	No. Apps	Strategy		Primary Platform			Resources							
		C/S	Downsizing	C/S or LAN	Mini	Mainframe	Corp IS	Div/IS	User Staff	SI	Other Outside Svcs	Packaged SW	Using EDI	Outsourced
Client/Server Applications														
Financial	20	20	9	13	2	7	15	9	13	5	10	13	5	2
Human Resources	10	10	1	4	2	5	7	3	5	3	3	5	6	0
Infrastructure	7	7	3	4	1	1	4	3	6	3	5	5	4	1
Office Systems	6	6	3	3	2	3	6	2	4	4	3	6	3	2
Planning & Analysis	2	2	1	1	1	1	1	1	1	1	1	1	0	0
Sales & Marketing	5	5	2	5	1	1	2	1	3	3	0	2	2	1
Cross-Industry Systems	2	2	0	0	1	1	2	1	1	1	1	1	0	0
Telecom Customer Systems	8	8	3	3	2	4	6	6	5	4	5	7	5	0
Telecom Operations Support Systems	12	12	4	2	4	2	8	8	11	8	8	9	7	3
TOTAL - C/S Apps	72	72	26	35	16	25	51	34	49	32	36	49	32	9
C/S Apps Compared With All Apps														
Percent of all apps (%)		48	17	23	11	17	34	23	33	21	24	33	21	6
Percent of C/S apps (%)		100	36	49	22	35	71	47	68	44	50	68	44	13

An explanation of the column headings follows:

- “Number of Applications” is the total number of applications for each of the application categories.
- The “Strategy” heading contains two subheadings, “C/S” and “Downsizing.” The “C/S” count by category indicates the number of applications within the category that will be implemented using a C/S architecture. The count under the heading “Downsizing” represents the number of C/S applications out of the total that are being implemented as part of a general downsizing strategy.
- The “Platform” heading indicates the number of times that one of the three major platform classes was mentioned as the key implementation platform.
- The “Resources” heading covers six sources of potential resources that will be employed as part of the implementation process. As was the case with the question regarding platform, more than one response per application was permitted.
- Finally, for each application, respondents were asked to indicate whether the application would use EDI or be outsourced. The last two columns give a tabulation of those responses.

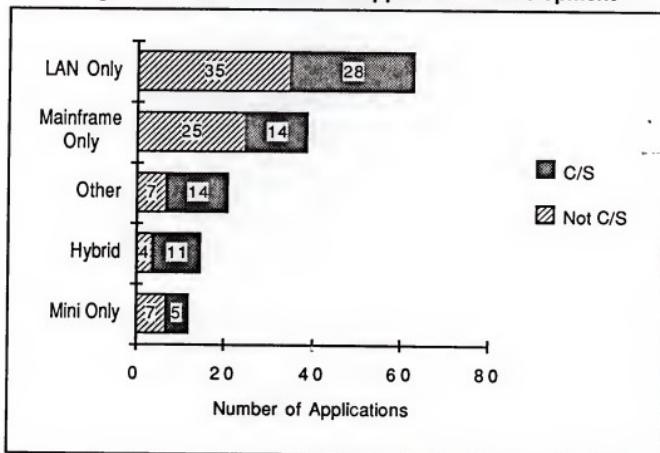
An explanation of the rows is as follows:

- The first set of rows represents the leading application categories.
- The “TOTAL – All applications” row adds up the rows describing the application categories.
- The above rows are repeated for applications where the respondent indicated that there was a major strategy to move to C/S systems.
- The penultimate row takes the “TOTAL – All applications” and divides each column total by the number of applications to give a percentage. The final row calculates a similar percentage for C/S applications, so that they may be compared with the population as a whole.

E**Target Platforms**

Exhibit III-5 shows the target platforms for the 150 applications in the sample for which platform information was available. Users were asked to identify their primary application platform for applications undergoing major changes.

EXHIBIT III-5

Target Platforms For Planned Applications Development

Forty-two percent of all applications development will be accomplished on local area nNetwork platforms. The more traditional mainframe solutions have only 26% of all applications.

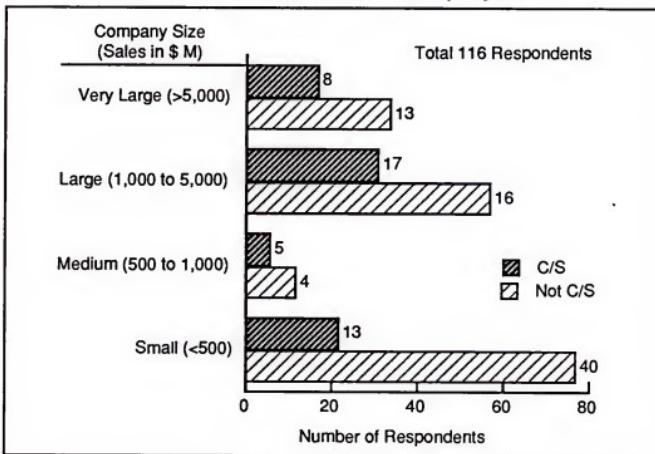
F**C/S Implementation By Size Of Company**

Based on company size, large companies with revenues of \$1 billion to \$5 billion are planning to commit over half their applications to C/S technology.

Exhibit III-6 below shows C/S implementations by size of company.

EXHIBIT III-6

Use of C/S as a Function of Company Size



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IV

Management and Budgets

This chapter discusses applications management and budgeting. The chapter is organized as follows:

- Section A provides an analysis of the role that IS departments and user management play in project management of applications.
- Section B analyzes resources that will be used to implement applications, the emphasis being on development rather than overall project management.
- Section C analyzes expenditure plans, that is estimated budget sizes for investment in new systems.
- Section D analyzes budget growth rates, that is the amount that respondents expect their budgets to grow annually over the next two years.

A

Project Management

Respondents were asked for each application who was managing the project. Corporate IS is the project manager for the majority of new applications.

- Of the 150 applications, 33 (22%) will be managed by user management. This is lower than the 40% found in the banking and finance study.
- Corporate IS will manage 84 (56%) of the projects. Divisional IS will manage 20 (13%).

The remaining projects are typically managed by cross-departmental teams. Of 150 applications, 72 of them are moving or have already migrated to C/S solutions. Exhibit IV-1 graphically shows the project management responsibilities, as a percentage, for all applications.

Exhibit IV-2 shows the number of applications managed by each organization for both the entire application set and just C/S applications. Exhibit IV-3 shows the project management responsibilities, as a percentage, for C/S and for all applications.

EXHIBIT IV-1

Project Management for All Applications

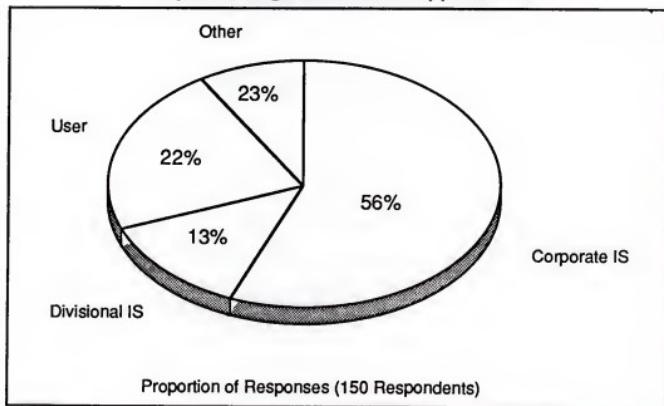


EXHIBIT IV-2

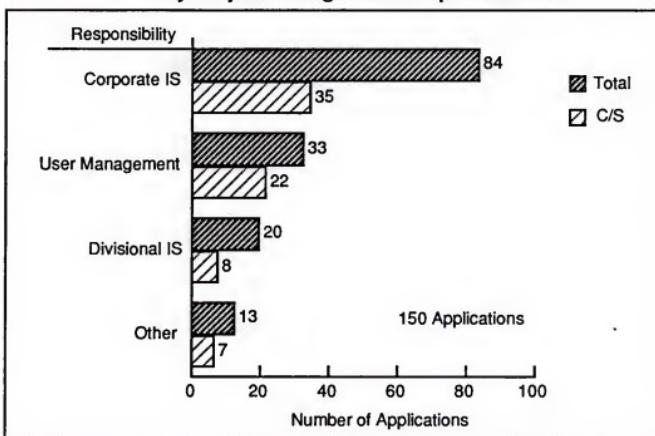
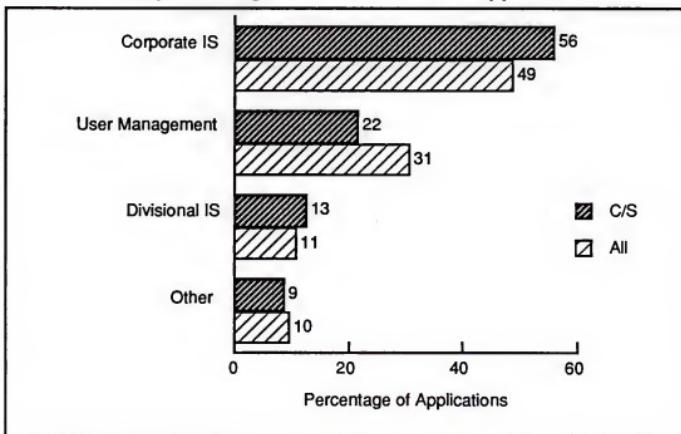
Primary Project Management Responsibilities

EXHIBIT IV-3

Project Management for C/S and All Applications

B

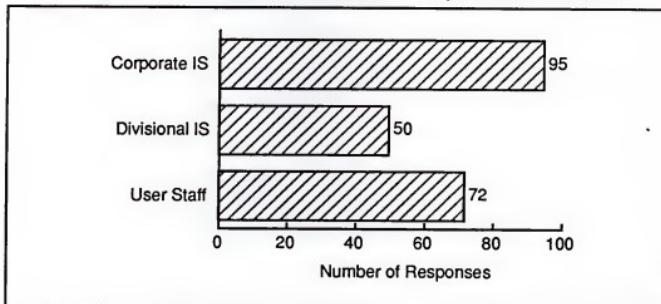
Implementation Strategy

1. Sources of Development Resources

Exhibit IV-4 shows the resources required to implement the 150 applications.

EXHIBIT IV-4

Internal Sources of Applications Development Resources



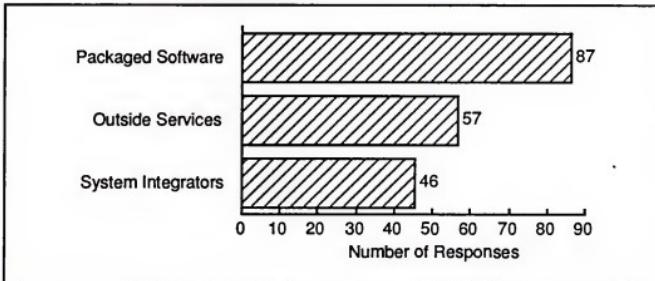
For almost 33% of the projects, user line or staff management will assume direct implementation responsibility. Size of institution is not a differentiating factor for project implementation strategy. Corporate IS continues to have a key role in systems implementation. Whether the organization is large or small, corporate IS is a primary resource in 63% of the applications.

2. Use of Software Products and External Resources

As shown in Exhibit IV-5, over 38% of the implementations planned for the next two years will use packaged software.

EXHIBIT IV-5

Use of Outside Products and Services



C

Expenditure Plans

Exhibit IV-6 shows the anticipated amount that each of 102 respondents expects to spend on applications changes in 1994. The spending amounts, shown as a range, are plotted against the number of mentions. The shading differentiates between respondents that mentioned C/S as a key strategy and those that did not, marked non-C/S. As can be seen in the under \$100K range, a high proportion of non-C/S systems is planned. At the top end of the range, 9 out of 12 respondents indicated that they would spend over \$10 million to implement a C/S strategy.

EXHIBIT IV-6

Applications Budgets for C/S and Non-C/S Systems

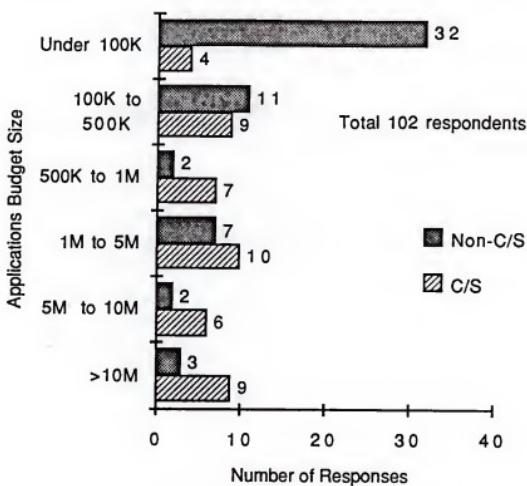
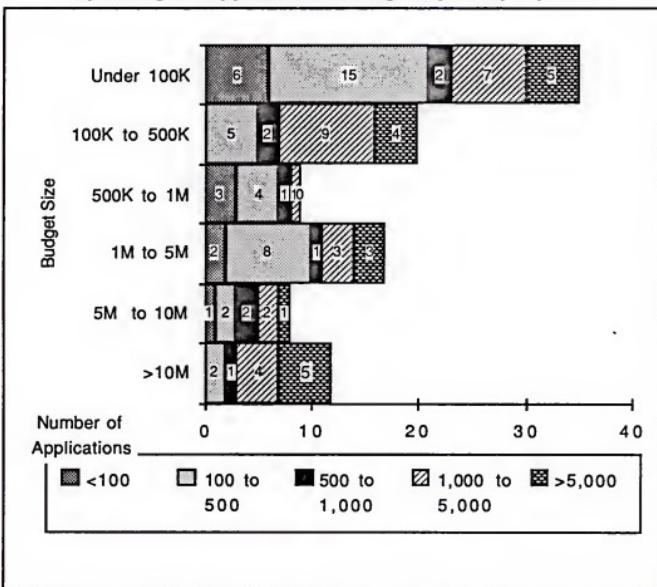


EXHIBIT IV-7

Spending On Applications Changes by Company Size



In Exhibit IV-7, the vertical axis shows budget size and the horizontal axis, number of responses. The legend shows company revenues. Most budgets were in the under \$100M range. Most of the large budgets—over \$10M—tend to be in larger companies, with over \$1B in revenues.

D

Budget Growth Rate

Respondents were asked to identify how much their applications budget would grow annually over the next few years. This includes software and staffing costs associated with applications development. Exhibit IV-8 shows the distribution of application budget growth rates for all applications and for C/S applications. At the lowest budget level, non-C/S budgets are growing faster than C/S budgets. This is because at the low-end budgets are often spent on single user software packages for Windows-based LANs.

EXHIBIT IV-8

Annual Spending Growth Rates for Applications Development

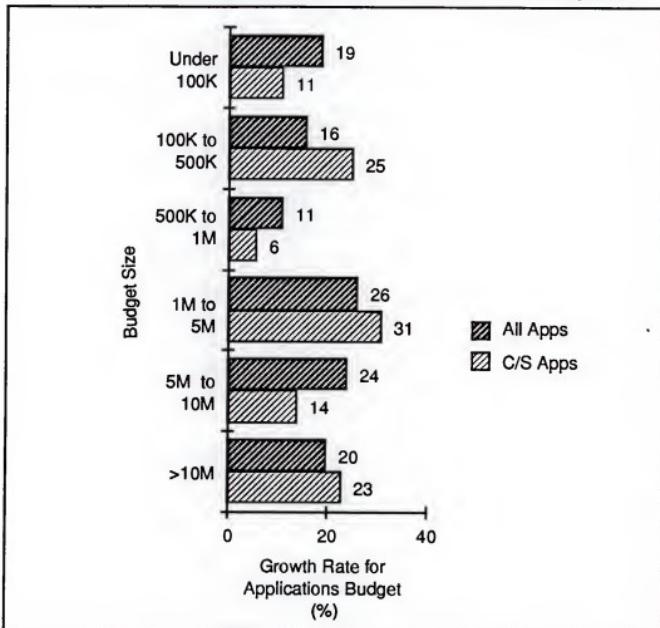
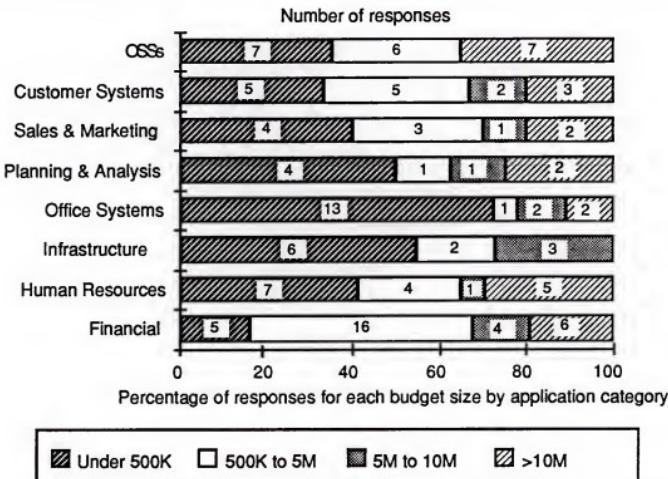


Exhibit IV-9 shows how the budget size varies for each application. The chart shows for each application the percentage of responses that stated a given budget size. The text on each element of the chart shows the number of responses. The legend gives the budget sizes. In the survey, office systems have relatively low budgets compared with financial applications. OSSs and customer systems also have large budgets.

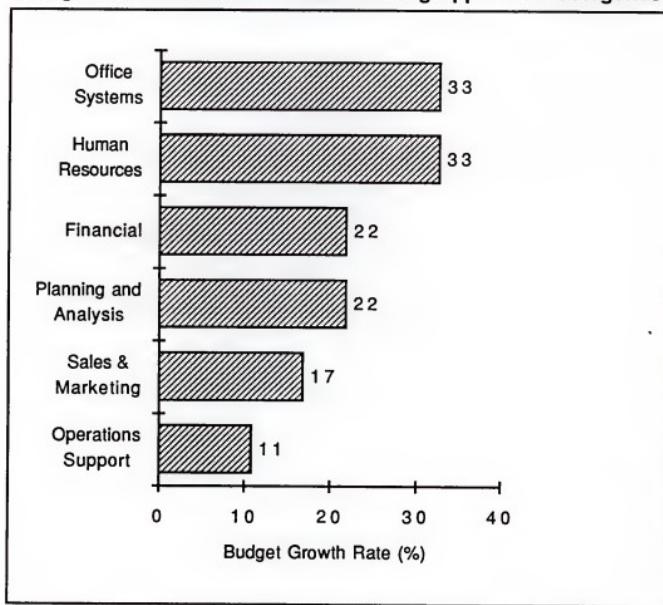
EXHIBIT IV-9

Budget Sizes for Each Applications Category



Examining the data in more detail, the applications being implemented where the budgets are growing the fastest are shown in Exhibit IV-10.

EXHIBIT IV-10

Budget Growth Rates for Fastest Growing Application Categories

Operations support systems budgets, which are traditionally large, are growing at about 11%. This includes inventory and materials management. As companies re-engineer their supply chain there will be opportunities for integrating new systems across company boundaries with existing telephone company systems. Customer support system budgets—that are proving to be an excellent opportunity for C/S vendors—are only growing at about 3% according to the survey. Telephone Directory is also an attractive opportunity because of increasing pressure on telephone companies by alternative directory organizations.

V

Telecommunications Industry Application Case Studies

This chapter presents case studies based on interviews with three organizations. The interviews included McCaw Cellular Communications, Pacific Bell, and U. S. Computer Services.

A

McCaw Cellular Communications, 5400 Carillon Point, Kirkland, WA 98033

1. Application Description & Reasons for Implementation

McCaw plans to implement three major C/S systems over the next three years.

- Customer Care (Service) System
- Network Management System
- Billing System

The Customer Service System will be needed to handle new products as they are implemented and provide an improved user interface. The Network Management System will be needed to support their networks which are becoming increasingly complex. The Billing System will also need to be converted to support these complex products.

Note that all of these applications are now being developed with the understanding that McCaw will soon become a part of AT&T. This merger activity may present additional considerations as the requirements and performance definitions are developed.

2. Vendors Selected & Alternatives Considered

All three applications will be performed as systems integration projects with companies such as Andersen Consulting or Cincinnati Bell Information Services (CBIS) being considered to develop the Customer Service and Billing systems. Smaller systems integration houses will be considered for the development of the Network Services application. Typically, McCaw looks to outside vendors for development of products and services up to 70% of the time.

The primary architectural focus for these applications will be a choice of distributed, object-oriented, open C/S systems. The most likely platform will be UNIX-based hardware and software because it employs the same operating system on a desktop and server.

3. System Benefits

A key reason for moving all these applications to a C/S environment is for user benefit. To ensure successful implementation of these mission-critical projects, information services will retain primary responsibility for the Customer Service and Billing applications.

An all UNIX-based solution is likely to simplify programming objectives and interfaces, with NeXT being the probable vendor of choice. C/S tools should include NeXTStep and UNIX programmers' workbenches such as Digital's Cohesion and HP's SoftBench.

4. System Costs

All of these new C/S applications will require new hardware, software and network communications. This year, they will need to spend about half of their \$60 million budget in order to meet their goals for operational systems within two to three years. The balance of that development budget should be expended over the next five years.

5. Summary

McCaw is obviously convinced that they see a very real trend towards C/S, object-oriented technologies. They believe that there will be more realtime processing versus traditional batch

processing applications. Of significant import, they see a merging of network and information services applications coupled with advanced network services such as Advanced Intelligent Network (AIN). AIN provides realtime access to carrier systems to define networks and change features and functions from a customer's site.

B

**Pacific Bell, Data Communications Group, 6533 Sierra Lane, Dublin,
CA 94568**

1. Application Description and Reasons for Implementation

Pacific Bell needs a logical network monitoring tool using HP's Openview to track their customers' network maintenance activities. Customer demand for a comprehensive network management system provided the impetus for the development of this system.

The Data Communications Group—a part of the non-regulated side of the telephone company—was given the charge to develop a comprehensive system that would track trouble ticket information, maintain records of available network component inventory, and visually display various network trouble locations.

The results of the alternatives analysis dictated the requirement for a three-part system using C/S technology. The system is now used in mission critical LAN and WAN operations and provides remote network management to customer's networks in healthcare, transportation, banking, education, and mortgage loan industries. It has been so well accepted that the company uses the maintenance tool in a value-added capacity to assist in its network sales demonstrations.

2. Vendors Selected and Alternatives Considered

The system was developed internally, as there was no standard application software package that could meet the goals and objectives. It evolved from much simpler computing tools based on Apple Macintosh and then PC-DOS architectures. The Data Communications Group evaluated several vendors and performed its own systems integration effort. It was decided that the system

would operate using UNIX on Sun's SPARC-based workstations using a C/S architecture. The system will use HP's Openview for network management.

The system has been active since October 1992. The company is now planning system upgrades and will probably replace the database function with an Oracle or Informix database. The goal is to attain a truly object-oriented relational database.

3. System Benefits

Pacific Bell believes that this operational support system provides significant benefits to its customers. It significantly enhances the promotion of its networks. Operations staff and customers can now get a more realistic picture of events surrounding an individual or widespread network problem. Logical tools are now in place to "see" the iterative process of fault isolation and repair as it takes place. Follow-up reports provide the necessary information for both customer and vendor to assess service levels and take corrective action as required.

4. System Costs

System cost estimates were not available.

5. Summary

This C/S system gives its participants an effective method to quickly grasp the nature and magnitude of customer problems and manage the longer-term impacts. Significant budgetary performance pressures mean that the C/S system continues to be scrutinized for its ongoing value. As a result, when sales staff use the system in network demonstrations they must provide feedback to management regarding its effectiveness in selling network products and services.

C

**U.S. Computer Services, 11020 Sun Center Drive, Rancho Cordova,
CA 95670**

1. Application Description and Reasons for Implementation

U.S. Computer Services (USCS) plans to re-engineer three major C/S applications within the next two years.

- Customer Service/Support (Alexis)
- Budgeting
- Accounting

The Customer Support and Budgeting systems are considered mission critical and will be converted to C/S to provide increased functionality and improved user interface capabilities. The Accounting application will also gain more functionality and new modules.

The corporate MIS department has implementation and operational responsibility for the new Customer Support and Budgeting C/S applications. However, the Corporate Finance department will retain its responsibility for all financial applications, including the implementation and on-going operation of the new C/S Accounting system.

The Customer Support and Accounting applications are being planned with the telecommunications industry convergence in mind. As part of a value-added marketing/support effort, the company's Corporate MIS group works closely with outside customer MIS organizations to strategically plan for the upcoming convergence.

2. Vendors Selected and Alternatives Considered

Typically, USCS uses outside vendors for about one third of their product and service development needs. For example, the company is currently using ESI's accounting systems for their Accounting application software and plans to evaluate PeopleSoft and EDP for the Human Resources component. Other C/S tools that are planned to be used in developing these applications include PowerSoft, Oracle's C/S Toolset, CDE, and PowerBuilder.

Potential system platforms include UNIX, MS Windows, MS Windows NT, and MAC OS. Some host-based UNIX applications will continue operation for the near-term. However, most of these other applications will make the transition to C/S technology within the next three to five years.

The company has anticipated the implementation of C/S architecture and has already converted much of their LAN/WAN communication networks to a digital transmission medium. This conversion accommodates the faster throughput requirements at substantially reduced error rates.

3. System Benefits

USCS believes that their move to a C/S architecture will result in significant benefits. The user will benefit from increased functionality and a reduction in training needs, while the company will benefit from the exploitation of cheap computing power distributed to the user desktop.

4. System Costs

The Customer Support and Budgeting systems applications will require investment in new hardware and software—the communication networks are already in place. However, some of these application investments were done to concurrently achieve other operational business goals.

USCS indicated that their 1994 development cost for the Customer Support project would approach \$150,000 and the Budgeting project would cost approximately \$50,000. Over the next five years, the company expects to focus half of its information systems development dollars on C/S applications.

5. Summary

While the MIS organization has some reservations in implementing C/S applications due to the operational and control challenges of a decentralized network, the organization, and the company, have demonstrated a major commitment to C/S architecture.

VI

Vendor Analysis

A

Survey Results

As part of the survey, respondents were asked to identify key vendors. These vendors were then given a satisfaction rating on a scale of 1 to 5 — 1 being dissatisfied and 5 being very satisfied. In addition, the proportion of their customers who mentioned C/S as a key strategy was estimated. Given the sample sizes are very small, these results should be used to aid understanding rather than as absolute measures. A tabulation of the major vendors mentioned is given below—some respondents mentioned more than one vendor. In all, there were 68 vendor mentions, many with a single mention only. Several small regional vendors were mentioned. Only the vendors mentioned more than four times are analyzed in Exhibit VI-1.

The first column gives the vendor, followed by the number of mentions, then the average rating, the percentage of customers mentioning C/S as a strategy and, finally, comments raised by respondents.

Exhibit VI-1

Vendor Satisfaction Ratings

Vendor	Number of Mentions	Average Rating	Percent Migrating to C/S (%)	Notes
Amdahl	5	3.60	60	Struggling with C/S...Good service
Apple	12	3.83	42	Very easy to use...Vendor fixed all problems
AT&T	5	4.00	40	Good tech support...Mediocre marketing
Compaq	14	4.07	64	Very satisfied...Good performance
D&B	8	3.00	63	Weak support...No reporting
DEC	17	4.06	24	Good performer...No problems
Dell	5	3.20	20	Cost effective...Good performance
HP	9	4.22	44	Very good performance...Good service
IBM	54	3.65	54	Cost issues...Mixed applications reviews

B**Video-On-Demand Buyers and Sellers**

Video-on-demand (VOD) is an emerging opportunity for C/S systems. A number of vendors are stepping up to supply telephone and cable TV companies. The intent of this application is to provide consumers with information services and video entertainment. Massive databases with high-bandwidth are needed to store video, text and graphics.

Currently, companies such as Time-Warner, are undertaking trials to understand technical challenges and user requirements. It is likely to be a few years before this technology is mass-deployed. However, the players in the trial rounds can expect success at later stages as systems become more robust. A key challenge for providers is to work out the balance between subscriber fees and advertising revenues to finance such services.

None of the user organizations contacted by INPUT in Chapter V, *Telecommunications Industry Application Case Studies*, were willing to discuss their proprietary plans for VOD. However, all major telephone companies and cable companies are making substantial investments in video systems.

Software vendors need to partner with the major UNIX server vendors, database vendors, telecommunications system integrators and communications equipment vendors. There are opportunities for creative user-oriented software, as well as for video operations support software. There is a demand for systems software utilities that can interface the servers to existing systems, network management software and customized databases that can support video objects.

Exhibit VI-2 reviews some of the primary buyers and sellers in the VOD marketplace.

Exhibit VI-2

Video-on-Demand Marketplace

Vendors	Buyers
AT&T Network Systems	GTE, Pacific Telesis, Southern New England Telephone, TCI, & Viacom Cable
Digital Equipment Corp.	Rochester Telephone, USA Video, & US West
HP	Pacific Telesis
IBM	Ameritech, Bell Atlantic, & Videotron (Canada)
ICTV (uses IBM servers)	Cox Cable & InterMedia Partners
Microsoft	NTT (Japan) & TCI
Oracle/nCube	Bell Atlantic, British Telecom, & US West
Silicon Graphics	Time-Warner

(Blank)

A

Applications Details

This appendix provides definitions of all the applications identified in this study. The applications are grouped according to categories. Exhibit A-1 includes all applications that are unique to INPUT's definition of the telecommunications industry sector. Exhibit A-2 contains definitions of applications identified in this study that INPUT defines as cross-industry.

A

Description of Applications

In telecommunications in particular, applications are being integrated to provide better customer services.

EXHIBIT A-1

Telecommunications Industry by Application Types

Application Category/Type	Description/Examples
Telecommunications Applications	
• Customer Support Systems	Billing, Customer Records, Customer Service, Directory Assistance, Operator Support
• Operations Support Systems	Facilities Management, Inventory, Loop Maintenance, Materials Management, Mobile Craft Support Systems, Network Monitoring, Network Routing, Remote Switching Center Control, Repair Scheduling and Routing, Repeater Management, Service Orders, Service Quality Monitoring & Reporting, Software Defined Networks, Switching Center Maintenance and Monitoring, Switching System Support, Transmission Systems, Work Order Tracking
• Directory Management	Yellow, White and Blue Pages Systems Management, Yellow Pages Advertising Support
• Regulatory	Pricing of Regulated Services, Regulatory Filings and Tariff
• Information Services - Messaging, On-line Databases, Video	Public Electronic Messaging Services (Consumer and Commercial), Information Databases, Video Services
• Systems Research and Development	Service Requirements Planning, Systems R&D

EXHIBIT A-2

Cross-Industry Application Types by Category

Application Category/Type	Description/Examples
Cross-Industry Financial	
• Accounts Payable/Receivable	Traditional systems to handle invoicing and payments and manage receivables
• Cost Accounting	Systems to analyze the costs of goods and services
• Financial Reporting	Financial systems for the generation of management information
• Fixed Assets	Systems to track the book value and depreciation of assets
• General Ledger	General Ledger
• Integrated Financial Systems	Integrated accounting modules with reporting
• Other financial	Foreign exchange
General Infrastructure	
• Database Conversion - General	Migration to a new data base architecture
• Database Conversion - Relational/Distributed	Migration to a relational or distributed (or both) architecture
• Data Conversion	Projects to convert the date from one data base environment to another
• Hardware Upgrades	Projects to upgrade or migrate to new hardware
• Imaging Systems	Installation of infrastructure to support imaging applications
• Operating System Upgrades	Operating System Upgrades
• Platform Migration - C/S	Projects to upgrade or migrate to new client/server hardware
• Platform Migration - General	Projects to upgrade or migrate to new general purpose hardware or networks
Human Resources	
• Human resources information system	Human resources information system, HRIS
• Payroll	Payroll processing
Office Systems	
• Electronic mail and messaging systems	Electronic mail systems
• Word Processing Systems	Installation of applications that use word processing

EXHIBIT A-2 (Cont.)

Cross-Industry Application Types by Category (Cont.)

Application Category/Type	Description/Examples
Planning and Analysis	For this report the spreadsheet applications were combined with office systems.
• Executive Information System	Decision support systems for executives
• Financial Modeling	Systems to support financial business modeling and analysis
• Spreadsheets/Databases	Applications that use desktop spreadsheets and databases
Other Cross-Industry	
• Voice mail	Voice mail systems
• Help desk	Support systems for internal computer users
• System Administration	Backup, password management, performance management, upgrade support

B

Questionnaire

Telecommunications Client/Server Case Studies

I. General Information

1. Name _____ Title _____
Tel. # _____
2. Company _____
3. Address _____

4. What are the company's gross revenues for this fiscal year?
 - a. \$ _____
 - b. Current domestic percent of market? _____ %
 - c. Current international percent of market? _____ %

II. Specific Client/Server and Systems Information

1. What is your company's IS organizational structure?
 - a. Centralized Corporate MIS? _____
 - b. Distributed Divisional MIS? _____
 - c. Is Engineering IS a separate entity? _____
 - d. Does Engineering IS report into MIS? _____

e. Which areas are outsourced and why?

2. Which new applications have you implemented in the last 5 years and why?

3.a. Which applications do you plan to re-engineer or replace in the next 5 years and why?

3.b. Are any of these applications being considered in the support of the joint telco/cable TV industry convergence?

3.c. Which division or outside entity will have primary responsibility for each project/application installation?

4. Which of the above applications are C/S and of those, which are mission-critical?

5. In what time frame do you foresee making the transition to each of these C/S application?

6. To what degree are you looking to outside vendors for products and services?
_____ %

7. Which critical C/S applications required investment in new hardware, software, and network communications?

8. Which applications are you planning to acquire, and which vendors are you evaluating for each? (such as packaged software, systems integrators, and/or other professional services)

9. Which alternative architectures are likely to be considered?

10. What system platforms are most likely to be used? (regarding hardware and operating systems)

UNIX _____ MS Windows _____ MS Windows NT _____
DOS _____ OS2 _____ AS-400 _____
MAC OS _____ Tandem Guardian _____ Other _____

11. What are the key, most important reasons for moving to a C/S environment? .
(e.g., user benefits, administration benefits, &/or program development
benefits)

12. Which C/S tools do you plan to use in developing C/S applications?
Gupta _____ PeopleSoft _____ PowerSoft _____ Others _____

13. What is your total budget for each C/S application?

- a. For this year?

- b. Over the next 5 years?

14. What application trends do you see in the telecommunications industry over the next 2 to 5 years?

15. Which applications have been most successful in improving user effectiveness?

- 16.a. Which applications have been most successful in terms of vendors, staff support, etc.?

- 16.b. Which applications have been least successful in terms of vendors, staff support, etc.?

- 17.a. Which applications provided you with the biggest return on investment?

17.b. Which applications did not provide you with the expected return on investment?

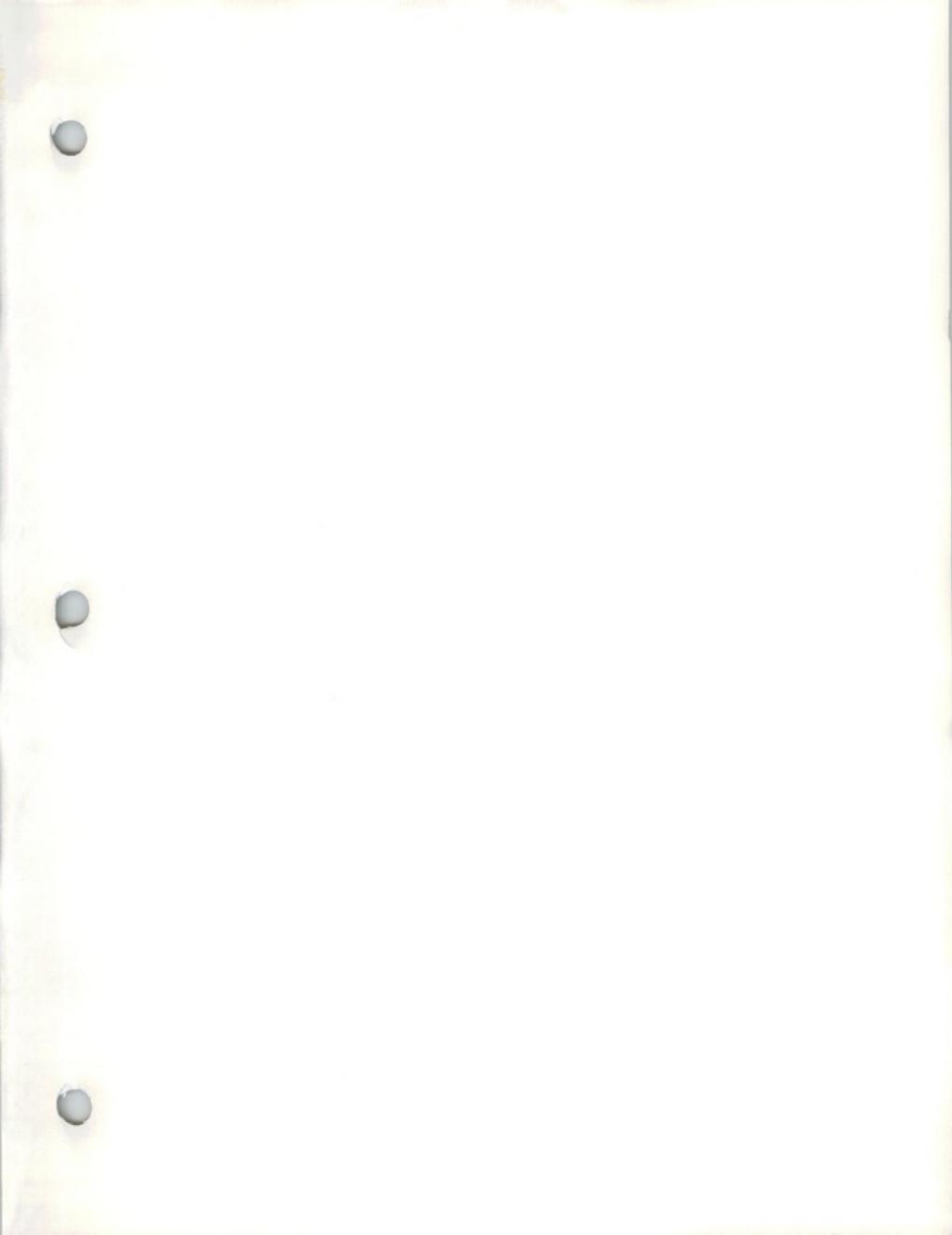
C

Vendors

This section gives the names and addresses of vendors mentioned in the report.

Vendors Noted in Report

Vendor	Address
America On-Line	8619 Westwood Center Drive, Suite 200, Vienna, VA 22182
Apple Computer	20525 Mariani Ave., Cupertino, CA 95014
Ardis	300 Knightsbridge Pkwy., Lincolnshire, IL 60069
AT&T Network Systems	Basking Ridge, NJ
Compuserve	
Digital Equipment Corporation	Maynard, MA
Hewlett-Packard	
IBM Corporation	Armonk, NY
INTEL Corporation	Santa Clara, CA
Internet	
McCaw Cellular Communications	5400 Carillon Point, Kirkland, WA 98033
Microsoft	Redmond, WA
Motorola	1303 E. Algonquin Road, Schaumburg, IL 60196
nCube Corporation	919 E. Hillsdale Blvd., Foster City, CA 94404
Oracle Corporation	500 Oracle Parkway, Redwood Shores, CA 94065
RAM Mobile Data	745 Fifth Avenue, New York, NY 10151
Silicon Graphics	Mountain View, CA
Sun Microsystems	Mountain View, CA



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- Software and Services Vendors
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 - Procurement Plans (PAR, APR)
 - Forecasts
 - Awards (FAIT)
- Commercial Application (LEADS)

CUSTOM PROJECTS

For Vendors—analyze:

- Market strategies and tactics
- Product/service opportunities
- Customer satisfaction levels
- Competitive positioning
- Acquisition targets

For Buyers—evaluate:

- Specific vendor capabilities
- Outsourcing options
- Systems plans
- Peer position

OTHER SERVICES

Aquisition/partnership searches

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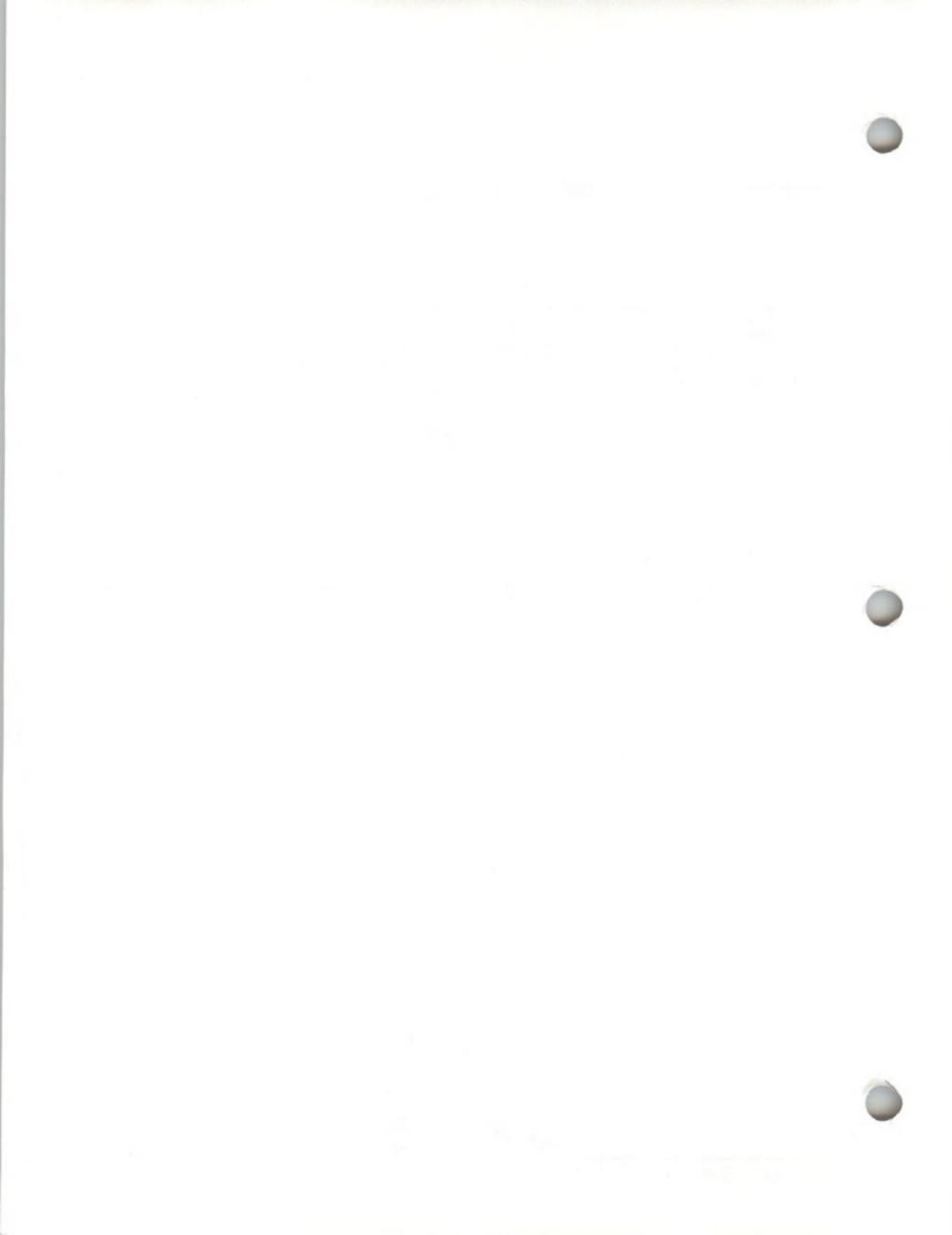
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VERTICAL MARKET ANALYSIS

Client/Server
Applications Trends

Utilities

Client/Server Markets and
Applications Program



J U L Y 1 9 9 4

Client/Server Applications Trends

Utilities

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**Client/Server Markets and
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***Client/Server Applications Trends—
Utilities***

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I

Introduction

This is the ninth in a series of reports analyzing trends in client/server (C/S) applications by vertical industry. These reports are produced as part of INPUT's Client/Server Markets and Applications subscription service. Each report focuses on a single industry. Additional reports compare industries in their approach to C/S.

A

Objectives

This report addresses the following issues with regard to the utilities industry sector:

- To what degree is the industry as a whole migrating to C/S architectures?
- Which applications are likely to be targeted for implementation over the next two years, and which are headed for a downsized C/S environment?
- Who is managing various aspects of the implementation or conversion of these applications? The central information systems function (IS), user management, its local IS function, or third parties?
- To what degree are industry participants looking to outside vendors for products and services?

B**Scope**

The scope of this analysis is limited to the utilities industry sector within the United States. Specifically, INPUT defines this sector as including those industries containing the leading two digit SIC (Standard Industrial Classification) code 49, electric, gas and sanitary services. Ninety six (96%) of the companies in this study came from the electric and gas utilities portion of the sector.

C**Methodology**

Data for this analysis was taken from INPUT's applications database. This database is built from a continuous telephone interview program to gather information about companies' applications plans. The field interview process was initiated in 1993.

In some instances more than one interview was conducted per institution. This was particularly true for large firms such as Public Service Electric and Gas, where interviews were conducted with multiple operating units. The number of companies in the utilities sample was 112. The total number of interviews was 136.

These 136 interviews were the primary source of data for this report. They provided information on 282 different applications that will be implemented in the next two years.

Respondents identified the applications or projects they would be implementing over the next two years using their own terminology, rather than being required to categorize applications by some predetermined set of definitions. Once the survey was completed, INPUT analyzed the 282 project descriptions and coded them into application types. The types were then further grouped into application categories for purposes of this analysis. Exhibit I-1 describes the applications by category.

EXHIBIT I-1

Definition of Utilities Application Categories

Application Category	Application Type
Utilities Applications	
Customer Systems	Customer billing, customer service & support, customer service scheduling, customer help desk
Energy & Power Management	Demand history, energy management, environmental management, fault & failure analysis, load balancing, power plant performance monitoring, usage tracking
Engineering	Capacity planning and forecasting, nuclear systems planning, requirements tracking
Facilities Management	Facilities management, facilities mapping, materials management
Field Operations	Field maintenance, field personnel scheduling, field support, meter reading
Transmission & Distribution	Customer delivery system, SCADA systems, service outage reporting, transmission & distribution management, transmission planning
Cross-Industry Applications	
Administration	Business integration, corporate policies, training
Education	Computer assisted instruction
Human Resources	Affirmative action/EEO, applicant tracking, benefits administration, compensation/job evaluation, human resources information systems, labor/job analysis
Infrastructure	Hardware, software & network upgrades, telephone or voice response systems
Legal	Legal support systems, regulatory compliance

EXHIBIT I-1 (Cont.)

Application Category	Application Type
Cross-Industry Applications	
Office Systems	Electronic mail & messaging, desktop publishing, work processing
Planning & Analysis	Decision support systems, executive information systems, spreadsheets
Purchasing	Bar coding, EDI, inventory management, purchasing
Sales & Marketing	Order entry/tracking

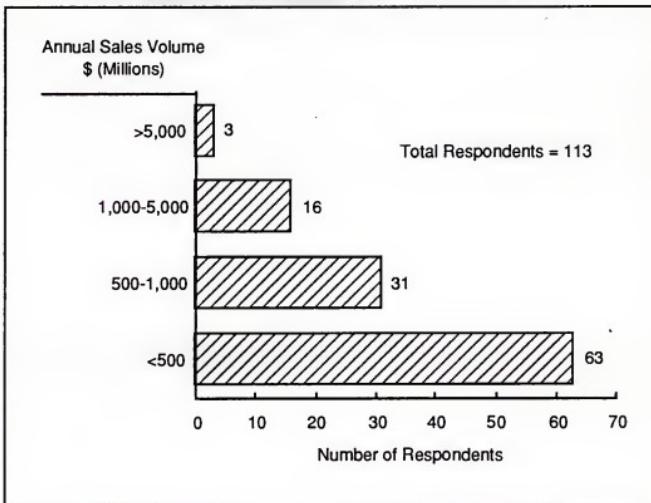
Additional information was drawn from secondary research sources and INPUT's existing library of current information on utilities to round out the analysis.

D

Characteristics of the Sample**1. Sample Demographics**

In general, the sample represents a cross-section of utilities companies. The breakdown of respondents on the basis of annual company or divisional sales volume is given in Exhibit I-2

EXHIBIT I-2

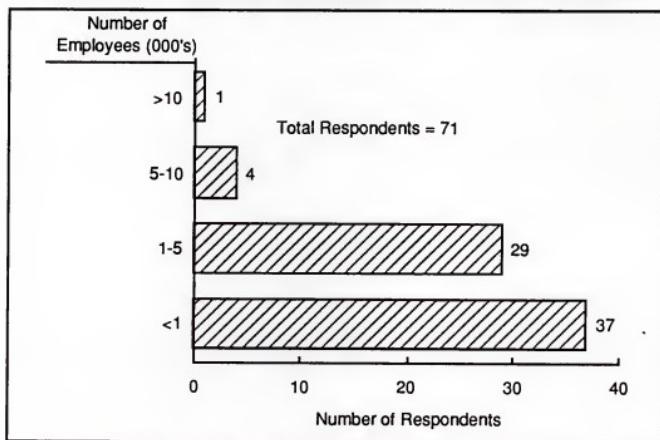
Distribution of Respondents by Sales Volume—Utilities

The average sales volume for the sample was approximately \$1.1 billion.

The average number of employees was approximately 1,440, with the population distributed as shown in Exhibit I-3

EXHIBIT I-3

Distribution of Respondents by Number of Employees—Utilities



2. Characteristics of Survey Respondents

Although the surveys are targeted at user managers with direct responsibility for line or staff operations, respondents sometimes referred interviewers to the information systems (IS) function for responses to all or parts of the survey. Consequently, respondents included members of the corporate IS function or divisional IS management as well as non-IS line or staff management. Exhibit I-4 gives the distribution of respondents by job class. The following definitions apply.

- **Line Manager** - A manager/executive responsible for line operations at a corporate or divisional level—e.g., VP of operations, VP of sales, director of product distribution, etc.
- **Staff Manager** - A manager/executive in charge of staff operations at a corporate or divisional level e.g., VP of human resources, chief financial officer, or director of purchasing.

- **IS Manager** - A manager/executive whose primary responsibility is the management of information systems activities at a corporate or divisional level.

EXHIBIT I-4

Job Classification of Respondents — Utilities

Job Classification	Proportion of Respondents (%)
Line Manager	8
Staff Manager	47
IS Manager	45

This distribution is comparable to the mix encountered in the discrete and process manufacturing surveys. However, the total proportion of user respondents (55%) is considerably less than the 78% in the banking and finance industry sector study.

In some instances line managers were unable to deal with questions regarding platforms, but were very clear regarding their applications requirements and plans. IS executives filled in the gap with more information on platforms, overall spending and discussion of the general direction of the IS function.

E

Organization

- Chapter II, *Executive Overview* provides a summary of the findings of this study.
- Chapter III, *Utilities Applications Trends* discusses the key applications that will undergo conversion or re-implementation by utilities companies over the next three years. It addresses such issues as:
 - Target platforms and platform combinations
 - Near-term investment levels in applications development
 - Project management and control strategy

- Analysis of the applications by application category
- Chapter IV, *Client/Server Directions in Utilities* analyzes the data at a more detailed level with particular emphasis on the role that client/server will play in utilities companies.

II

Executive Overview

This chapter summarizes the report.

- Section A provides a background on the utilities industry
- Section B discusses key findings
- Section C provides key statistics
- Section D gives recommendations
- Section E summarizes conclusions

A

Industry Background

1. Business Issues

For the utilities industry, the last decade has been one of change, and there is every indication that change will be the order of business for the 1990s. The primary factor in this change has been deregulation of the business, resulting in increasing competitive pressure in an environment of business and social uncertainty. In recent years it has become increasingly apparent that the "business as usual" approach to management in the industry is not only ineffective, but potentially fatal. New competition comes from several sources.

- Competition between different energy sources creates a high level of uncertainty regarding future demand. The growing environmental pressure for reduced vehicular emissions alone could change the entire supply/demand equation as pressure mounts for alternative vehicular power systems.

- Independent power producers and cogenerators frequently use gas as the power-generating fuel, feeding electrical power into the system and consequently changing the traditional value and price equations of these energy sources.

The net effect is supply and demand uncertainties resulting in an overall requirement within the industry for more business-like management of assets and expenses than existed in the days when most utilities held a real monopoly position.

In addition to these issues, the industry has had to cope with the country's growing consumerism. Public utilities commissions (PUCs), in theory, represent a balanced view on utilities' related issues. Rising consumerism coupled with the fact that many PUCs are made up of elective commissioners, has tended to weight the scales in favor of the consumer on a wide variety of issues ranging from prices to environmental concerns. As a consequence, the industry has spent an increasing amount of time and effort placating, selling, and in some instances fending off, its constituents.

The overall impact has been to gradually pressure the industry into a less bureaucratic, more aggressive business posture for the 1990s. This results in increased downsizing and process integration which significantly impacts the systems environment.

2. Information Systems Management

The utilities industry may be unique in that until recently, the concept of a totally centralized systems strategy, much less organizational approach has been practically nonexistent.

Essentially, three areas of systems development and management have evolved:

- Commercial systems, including financial and customer information systems, have consistently been managed and developed at a corporate level on large-scale mainframe environments.
- Engineering computing has maintained a separate domain, operating more like a Bechtel Corporation than the engineering arm of a manufacturing corporation.

- Energy management and power distribution systems have evolved as part of utilities operations, from the days of analog computers to the large scale on-line real-time mainframe environments.

In most instances the organizations responsible for each of these three classes of systems have maintained a level of independence from each other unprecedented in other industry sectors.

The current emphasis on business integration and competition is likely to change this approach in the current decade.

B**Key Findings****1. Client/Server Migration**

Despite the centralized approach to industry management for decades, client/server migration is a key strategy for the industry. Sixty percent (60%) of the planned applications are looking to C/S architecture as the platform of choice over the next two years. This level of C/S penetration is significantly higher than industries like retailing and somewhat lower than the rush to C/S technology in the manufacturing sector. The key driving forces include:

- The requirement to downsize organizational structures
- To meet growing requirements for customer responsiveness
- To reduce costs and improve the margins of utilities operations
- To make available to executive management the integrated information required to support business, as well as regulatory-based, management decisions.

This strong movement in the direction of C/S is leading to some decentralization of business and operational systems.

Applications from all three major systems groups—commercial, engineering and operations are looking at C/S technology.

Despite the industries reliance on large-scale mainframe environments, most of the investment in new computing

infrastructure (62%), will support C/S applications. So while the mainframe remains, sometimes as a server, C/S appears to be the long-range direction.

2. Applications Opportunities

The key opportunities for C/S applications in the near future are:

- Integrated financial systems
- Human resource information systems
- Customer information systems
- Supervisory control and data acquisition (SCADA) and energy management systems (EMSSs)
- Materials and facilities management systems

As the infrastructure to support C/S is further developed other systems will move on to the list of high opportunity.

3. Other Industry Trends

- *Outsourcing* is not nearly as popular in utilities as it has become in some other industries. Engineering and operational applications are directly tied to the delivery facilities and are usually unique. Even in the area of commercial systems, most utilities feel the management of their customer information systems is mission-critical and are reluctant to consider outsourcing.
- *Downsizing* from a business perspective is a significant trend and one of the reasons that utilities are looking to a more decentralized systems environment.
- As the industry moves into a more competitive environment, the demands for highly integrated financial, operational and human resource management information continue to grow. This is resulting in a more holistic approach to the management of the systems activity including:
 - Joint planning of infrastructure between engineering, operational and commercial systems functions

- Adoption of common standards for workstations and software platforms where possible
- The development of some integrated data architectures to support multiple aspects of the business

C**Key Statistics**

- The survey covered 112 companies and 282 applications. In some instances more than one interview was conducted per company. The total number of interviews was 136. The emphasis was on electric power and gas utilities.
- The percentage of applications moving to C/S was 60%. This percentage is significantly higher than in health care, insurance and retail, but lower than the percentage of C/S penetration in the manufacturing sector.
- Budgets for new applications systems are growing at an average rate of 16% for the next two years. Total IS budgets will grow at a rate of 19%, reflecting a strong investment in infrastructure by the industry.
- There were 28 companies that reported annual budget growth rates in excess of 20%. The bulk of these will be investing in major C/S infrastructure to support application migrations.

D**Recommendations**

1. For Vendors

The utilities industry is on the cusp of a major migration to C/S architecture. Furthermore, the management of IS, traditionally depicted as having a "not invented here" attitude is more open to packaged solutions and outside support. The net result is a window of opportunity for software and services vendors.

- Cross-industry applications in finance and human resources are in for a major overhaul and the trend is definitely to C/S. Packaged solutions will be acceptable, but vendors must be willing to accommodate some of the peculiar requirements associated with the regulatory reporting required by the industry.
- Turnkey C/S systems that support plant and/or transmission and distribution SCADA (Supervisory Control and Data Acquisition) will be in demand. Vendors will need to be able to demonstrate the advertised savings and be willing to tailor these systems to sometimes extremely unique facilities requirements.
- Distributed database systems that manage geographical facilities information should be a key technology for vendors in the mapping and imaging environments.
- Systems integrators should find a wealth of opportunities in utilities for re-engineering and the subsequent SI projects to make business management information out of here-to-for standalone functional systems.

Overall, the prospects for information services vendors are good to excellent.

2. For Utilities Companies

Client/server technology meets new systems requirements generated by downsizing and increased competitiveness in the industry. However, to achieve these benefits, some organization will need to take control of overall architectural planning in an environment where three different organizations traditionally went their separate ways. The key opportunities for IS in the utilities industry will be to:

- Form coalitions with the engineering and operational systems functions to establish architectural standards for data and platforms
- Actively seek outside C/S solutions which generate reduced costs for cross-functional applications and provide opportunities to generate the high-quality information required by utilities' executive in the 1990s

- Develop or demand from suppliers, applications implementation with built-in flexibility and low maintenance costs.

E**Conclusions**

The utilities industry appears to be looking to C/S technology as one component of re-engineering its business strategy for the 1990s. Despite the large machine orientation and fragmented approach to information systems management, the technology is offering solutions that reduce costs and support the industry in adopting a more competitive and customer-oriented posture. Most applications that are obviously adaptable to C/S technology are already moving in that direction. Innovative solutions are being sought to deal with applications traditionally thought to be "undooable" without mainframes.

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III

Utilities Applications Trends

This chapter presents a detailed analysis of the utilities subset of the applications database. The chapter is organized as follows:

- Section A analyzes the general trends identified in the survey.
- Section B analyzes target platforms and the types of resources that will be used to manage and accomplish the implementation.

A

General Trends in Utilities IS

The survey examined a number of key trends with regard to the evolution of old and the development of new applications over the next two years. Subject areas included:

- Anticipated changes in hardware and software platforms
- Expected levels of total IS and applications spending
- Anticipated changes in the IS organization
- Major IS issues

1. Anticipated Changes in the Systems Environment

Respondents provided information on specific changes in their systems environment over the next two years. Responses fell into three categories.

- **Upgrades** - Thirty-seven percent (37%) of the respondents anticipate that upgrading their existing systems will be the predominant change for their systems environments over the next two to three years. There is practically no variation as a function of company size.
- **Migration to C/S** - A significant proportion of utilities companies are adopting C/S migration strategies. Of the total survey population, 46% indicated that migration to C/S would be a primary strategy for upgrading the existing systems environment. This is approximately twice the proportion of companies in the financial industry and approximately equivalent to the proportion for manufacturing. In the case of utilities, the larger companies, more than \$1 billion in sales, are being somewhat more aggressive in terms of adopting a general C/S strategy with 53% in the more than \$1 billion range adopting the strategy as compared to 42% of those in the under \$1 billion class.

This difference is probably attributable to the fact that many of the larger companies are undergoing significant operational downsizing efforts in order to become more responsive to new market forces, including new sources of competition.

- **Increased/Decreased Standardization** - Movement toward increasing standardization in platforms and operating environments was predicted by 30% of the respondents, with only five respondents anticipating any decrease in standards. Close to 60% of those migrating to C/S expect to see improved standards as C/S systems that have grown up in various departmental organizations move to more common platforms and operating systems.

2. Expectation Levels for IS Spending and Application Improvements

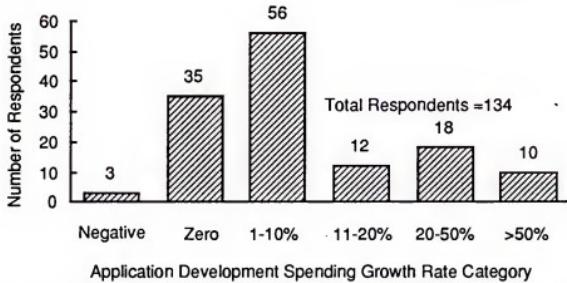
On the average, respondents anticipate growth in spending for information services to be approximately 19% per year for the next two years. Growth in spending for applications development is anticipated to be at a 16% rate for the same period. However, both rates were weighted heavily toward the high end by several companies reporting rates in the 100% to 600% levels.

The median growth rates probably provide a more realistic measurement. For over all IS and applications development, the median growth per year for the survey sample was 5%.

Exhibit III-1 shows the distribution of annual spending growth rates for applications development by growth rate category.

Exhibit III-1

Annual Spending Growth Rates for Applications Development—Utilities

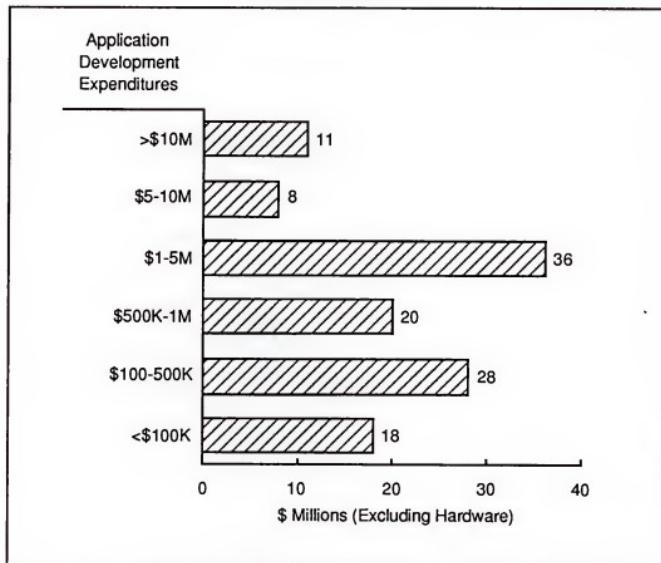


The twenty-eight companies that make up the greater than 20% category are undertaking major infrastructure or applications changes. Of this group greater than 55% will be migrating to C/S architectures in the process. Key applications areas mentioned by this group include:

- Major rewrites of customer service and billing applications
- Purchasing, inventory and work order management systems
- Rewrites of all financial applications
- Dispatching

Exhibit III-2 shows the distribution of expenditure levels for applications change in the next two years.

Exhibit III-2

**Expected Investment in Systems Change
1993-1995—Utilities**

Considering that respondents were speaking about systems investments for their individual departments or operating units (not about total company investment in IS), it is significant that more than 45% of the respondents expect to be spending more than \$1 million in improvements over the next two years.

Further analysis of the group of departments and divisions that anticipate expenditures of \$1 million and above over the next two years indicates:

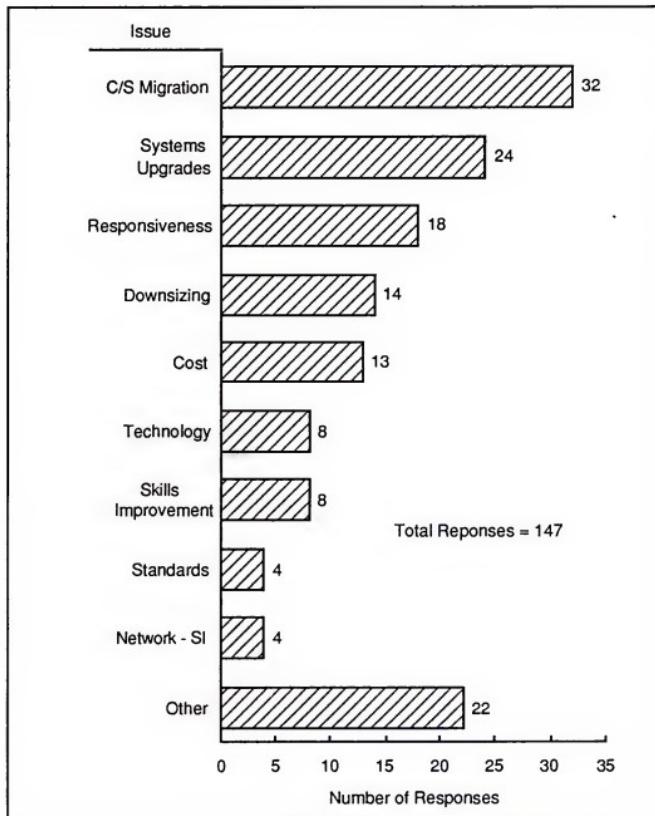
- Sixty-two percent of these organizations will be migrating to C/S. This is a full 16% of the sample average.
- For the most part, the expenditures will be made on large operational systems such as customer service and billing, work order, inventory and plant management and total rewrites of major financial suites.

3. Major Information Systems Issues

As shown in Exhibit III-3, the most frequently mentioned IS issue was C/S migration.

Exhibit III-3

Leading IS Issues—Utilities



A brief explanation of each category follows.

- **C/S Migration** - Planning for, implementing or downsizing to C/S technology
- **Systems Upgrades** - The need to upgrade existing systems to handle new requirements or increased capacity
- **Responsiveness** - The ability of the systems environment to respond to changing application needs and user management information requirements
- **Downsizing** - Adapting the systems environment, applications and infrastructure, to deal with downsized business operations
- **Cost** - Downsizing or distribution of existing staff or general budget reductions involving systems expenditures
- **Skills Improvement** - "Re-tooling" in-house staff to deal with changing skill requirements brought on by new technology
- **Technology** - Using new technology to add functionality or improve the operational characteristics of systems
- **Network/Systems Integration** - Network integration itself or the integration of applications across a distributed network
- **Standards** - Improved connectivity, the portability of applications across multiple platforms and the adoption of common standards for workstation/PC and network interfaces
- **Other** - Miscellaneous other responses

In general, utilities companies tend to be focused on fundamental adjustments in technology. Traditionally, utilities companies have been users of large mainframes on the business side of the house, and highly tailored systems (also involving large-scale compute capacity) on the engineering and operational management sides. Frequently, these three sides of the house were under the management of totally independent systems functions. In recent years, the operations side has migrated to workstations and mini-computers. Now it appears that as the business side of the utilities industry begins to downsize and decentralize decision making authority, it will be looking to C/S technology to provide the flexibility to meet a growing number of

user demands. This is particularly true in the area of customer service and billing. Issues are summarized below.

- Responsiveness to changing business conditions and growing competition are also major concerns and ranked third in the list of issues.
- The need to enhance or re-engineer systems in a manner that improves flexibility and reduces operating costs as well as providing information to support decision making.
- Cost remains an issue, but not as critical as in some other industries due to the fact that to some degree, costs can be passed on through regulatory rate adjustments.
- Skills improvement is not as big an issue as it is with some other industries. In many instances, utilities companies have been leaders in the use of C/S technology in engineering and operations and have developed in-house expertise in these areas. At least five respondents felt that these in-house skills could be leveraged to support the migration to C/S technology for business applications.

Overall, the utilities industry appears to be taking a more technology driven approach to C/S migration. To some degree the question of whether C/S computing will address future needs is already decided. The issues confronting the industry focus on how to put C/S infrastructure into place.

B

Utilities Applications Trends

For each application identified as critical in the next two years, respondents were asked to provide information on:

- Target platforms
- Project leadership strategy
- Project staffing

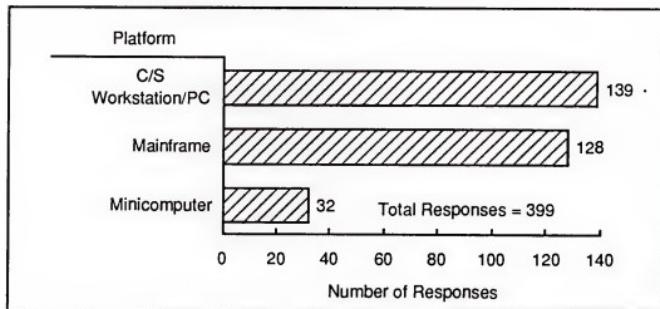
- The use of software packages
- C/S and/or downsizing strategy

1. Target Platforms

Approximately 46% of the applications developed over the next two to three years will employ a workstation/PC-based platform component, as shown in Exhibit III-4

Exhibit III-4

Target Platforms for Applications—Utilities



However, mainframes will play a much more significant role in utilities companies' applications plans than in the manufacturing sectors. While mainframes will be a key platform component in 42% of new or re-engineered applications in utilities over the next two years, the comparable percentages for discrete and process manufacturing will be 28% and 36% respectively. The utilities industry's continued reliance on mainframes is comparable to the financial sectors where 48% of insurance and 42% of banking and finance planned applications will use mainframes as a platform element.

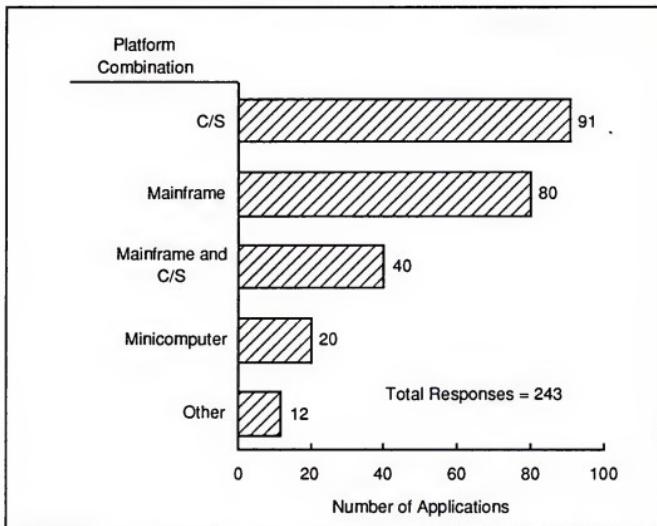
However, the data shown in Exhibit III-5 indicates that in the utilities sector the applications being developed over the next two to three years will make significant use of mainframes as part of the C/S architecture. For example, 40 out of 243, or 16% of the applications will make use of C/S architecture coupled with mainframes operating in a super server capacity. In addition,

the "other" category mentions mainframes as part of a three-tiered architecture.

This appears to be a particularly popular strategy for providing data connectivity between centralized billing and increasingly distributed customer service functions.

Exhibit III-5

Target Platforms for Planned Applications Development—Utilities



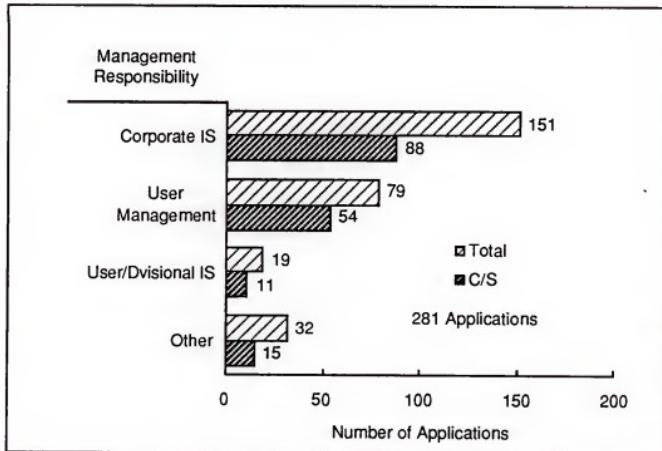
This distribution of platform combinations is similar to that of the financial sectors where huge databases represent a challenge for current C/S technology, but the need for better customer service as a differentiating factor and distributed information to support local operations requires access to information on a decentralized basis.

2. Project Leadership Strategy

Corporate IS will continue to play a major role in project management for applications development in the utilities sector, as shown in Exhibit III-6.

Exhibit III-6

Applications Development Project Management—Utilities

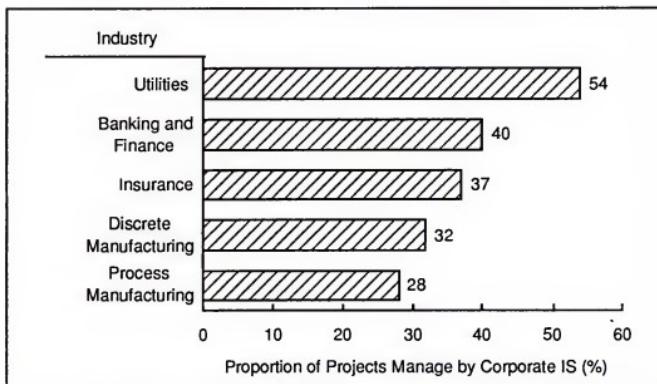


About 54% of the projects will be implemented with corporate IS assuming direct project management responsibility. Line management will dominate the remainder, leading 28% of the efforts. Many of these will be focused on the engineering and operating side. The other category consists mainly of joint efforts, or projects that will be managed by systems integrators.

Corporate IS will play a more dominant role than INPUT has seen in other industry sectors, where user management seems to be playing an increasingly larger role in direct project management. In fact, as shown in Exhibit III-7, the proportionate use of corporate IS for applications implementation is significantly higher for utilities than the other major industries analyzed to date, including banking and finance where centralized IS has always played a dominant role.

Exhibit III-7

Use of Corporate IS for Project Management

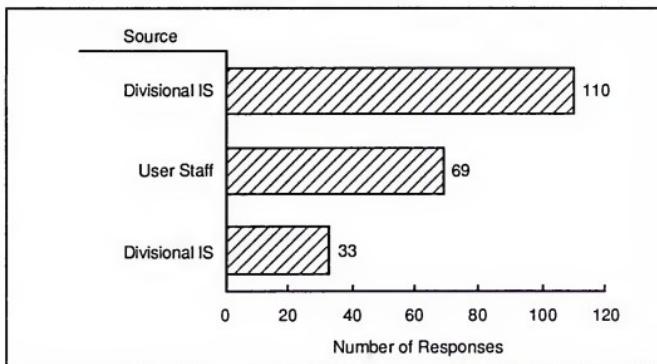


3. Sources of Development Resources

When it comes to the actual development process, corporate IS is still the leading provider of resources, as shown in Exhibit III-8.

Exhibit III-8

Internal Sources of Applications Development Resources—Utilities



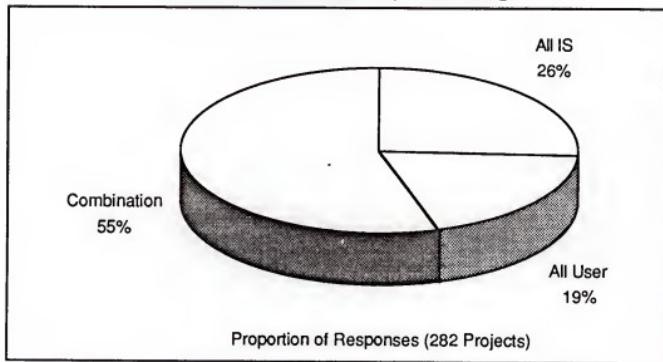
However, the participation of user staff and IS resources from divisional operations in project implementation is significant. This pattern is more consistent with other industry sectors than the findings on project management for the utilities sector.

As shown in Exhibit III-9, a high proportion of applications projects will be implemented jointly. Survey data indicates that those projects implemented totally with user resources are likely to be engineering- or plant management-oriented.

So, it appears that despite the high propensity to migrate to C/S environments, the utilities industry continues to maintain more centralized control on the applications development process than several other industry sectors showing a strong migration to C/S environments.

Exhibit III-9

Internal Application Project Staffing



4. Use of Software Products and External Resources

Over 47% of the implementations planned for the next two years will make use of licensed or purchased software packages. This usage level is on the high end for the range of industry sectors studied to date, and comparable to one of the highest banking and finance at 51%. The problem expressed by several respondents, is that there is not enough software available, particularly for C/S environments, that can be easily tailored to individual needs.

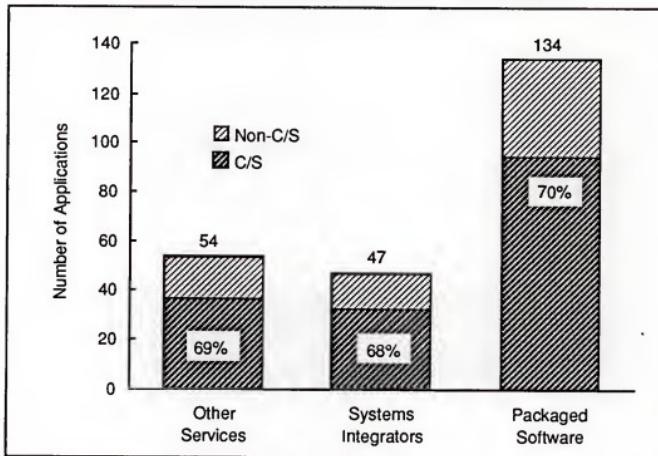
It should be noted that an industry research association, EPRI (Electric Power Research Institute), may play a growing role in providing software to the industry. This organization, funded by the largest power utilities, has been in place for many years and conducts research projects of mutual interest to companies in the industry. In recent years, much of this research has resulted in the generation of software packages. EPRI has undertaken a study to determine to what degree and under what operating policies it should produce packaged software. Depending on how that study comes out, EPRI could become a major force in utilities packaged software, particularly in the area of operations and engineering.

The use of systems integrators is also higher than most industry sectors. Respondents indicated that they would be using systems integrators for more than 17% of their development efforts. This use is between 5% and 15% higher than the other industries analyzed as part of INPUT's C/S service, indicating that there are significant opportunities SI firms.

Further analysis of the data shows that utilities companies plan to make heavier use of third party software and outside services for C/S applications than traditional implementation efforts.

Exhibit III-10 summarizes the use of each class of service for the sample along with the percentage of instances where third party software outside resources will be targeted at C/S applications.

Exhibit III-10

Use of Outside Products and Services—Utilities

For each class of outside service the use for C/S development projects is targeted at approximately 70%. Since the total proportion of C/S projects in the sample is 60%, the 70% penetration for outside software and services indicates a stronger tendency to use these services for C/S projects.

In summary, the utilities industry indicates that the migration to C/S computing is well underway. The management processes used to implement changes in the infrastructure and applications are likely to remain more centralized than in some other industries. Mainframes will continue to play a role and the opportunities for applications software and systems integration vendors are significant.

IV

Client/Server Directions in Utilities

The preceding chapter addressed trends with regard to utilities applications development. This chapter discusses the types of applications that will be implemented over the next two years, and the role that client/server architecture will play in the implementations. The chapter is organized as follows:

- Section A provides an analysis of the role that client/server is playing for each of the major classifications of applications.
- Section B identifies the leading client/server applications for the utilities industry group.

A

Client/Server Applications Analysis

1. Sample Summary

Exhibit IV-1 shows responses to key survey questions by application category.

Exhibit IV-1

Implementation Plans by Application Category—Utilities

Application Category	Number of Applications	Strategy		Platform		Resources						
		C/S - Client/Server	Downsizing	Workstation/PC	Minicomputer	Mainframe	Corporate IS	Divisional IS	User Staff	Systems Integrators	Packaged Software	Utilizing EDI
Financial	58	33	17	27	6	23	17	7	18	14	36	14
Human Resources	52	36	18	27	6	20	14	6	11	9	24	11
Facilities Management	29	18	8	13	1	16	16	5	11	5	14	2
Utilities Operations	27	12	5	11	2	10	13	2	3	5	13	11
Infrastructure	26	16	7	13	7	9	6	4	7	2	10	8
Utilities Customer Systems	23	12	4	10	2	15	14	5	7	3	8	6
Engineering	20	12	4	11	1	8	9	1	1	4	9	4
Planning & Analysis	13	10	1	10	2	3	6	1	3	1	6	1
Unidentified	11	4	0	4	2	2	6	3	1	0	5	6
Staff Department Support	10	6	4	5	2	4	2	0	7	1	4	5
Office Systems	7	6	2	5	0	2	3	0	0	1	4	4
Sales and Marketing	6	3	1	3	0	4	3	0	0	1	2	2
Totals	282	168	71	139	31	116	109	34	69	46	135	77
												46

An explanation of the column headings follows:

- "Number of Applications" is the total number of applications for each of the application categories.
- "Strategy" contains two subheadings, "Client/Server" and "Downsizing." The "Client/Server" count by category indicates the number of applications within the category that will be implemented using a C/S architecture. The count under the heading "Downsizing" represents the number of client/server applications out of the total that are being implemented as part of a general downsizing strategy.
- "Platform" indicates the number of times that one of the three major platform classes was mentioned as the key implementation platform.

- "Resources" covers six sources of potential resources that will be employed as part of the implementation process. As was the case with the question regarding platform, more than one response per application was permitted.
- Finally, for each application, respondents were asked to indicate whether the application would use EDI or be outsourced. The last two columns give a tabulation of those responses.

2. Observations on the Sample Mix and Categories

The sample contains a balanced mix of applications with 35% coming from the four categories that represent applications unique to the utilities industry facilities management, utilities operations, customer systems and engineering. As is the case in several other industry sectors such as financial services, there appears to be a heavy emphasis on financial applications. This is due to the following:

- Changes in federal and state regulatory reporting requirements are out-stripping the capabilities of existing financial systems.
- Re-engineering of financial systems offers opportunities for the downsizing of staff activities.
- A number of applications managed by corporate finance, and considered staff support in other industry sectors, are considered operational systems in utilities. Applications to account for power interchanges between utilities, as well as between private companies and utilities grids are a good examples.

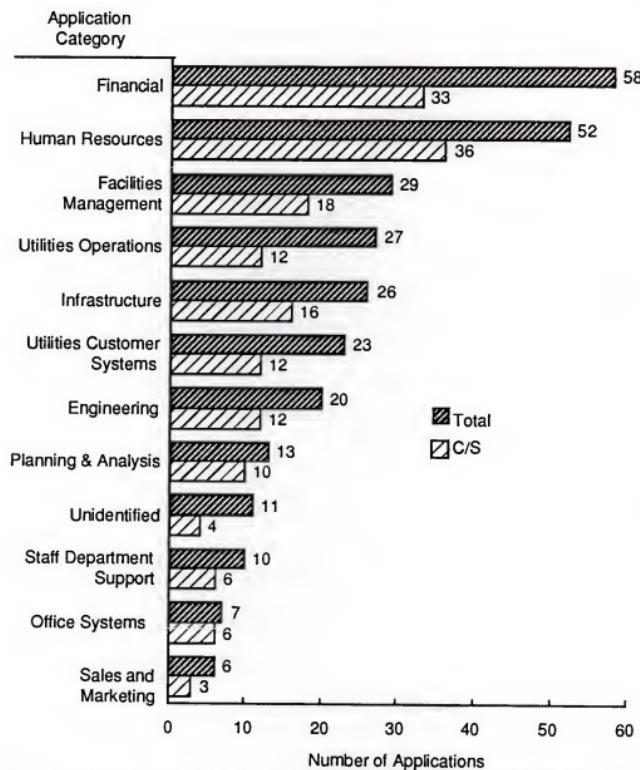
The large number of human resource applications is largely due to growing regulations to track exposure to environmental hazards, as well as increasing requirements for human resource information systems.

3. Client/Server Applications by Category

Exhibit IV-2 shows planned application changes by category compared to those that will use C/S architectures.

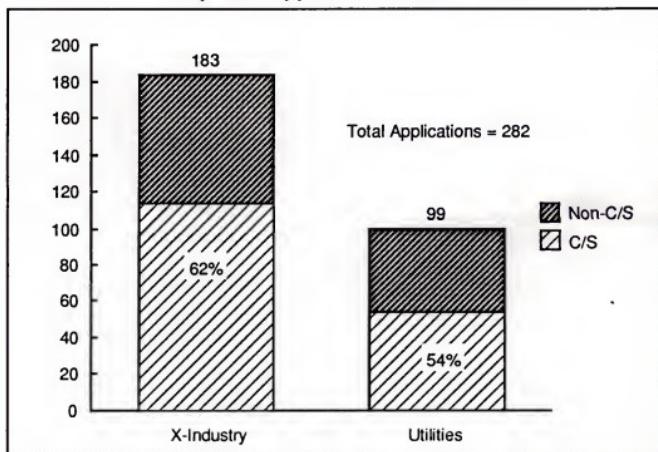
Exhibit IV-2

Planned Applications Changes and Use of C/S by Category—Utilities



Comparing the industry specific applications to those that are considered cross-industry (applicable to many industries) shows that the targeted use of C/S for industry applications is about 8% less than for cross-industry applications. Exhibit IV-3 shows the sample broken down by these two major classes of applications.

Exhibit IV-3

Use of C/S for Cross-Industry and Industry Specific Applications—Utilities

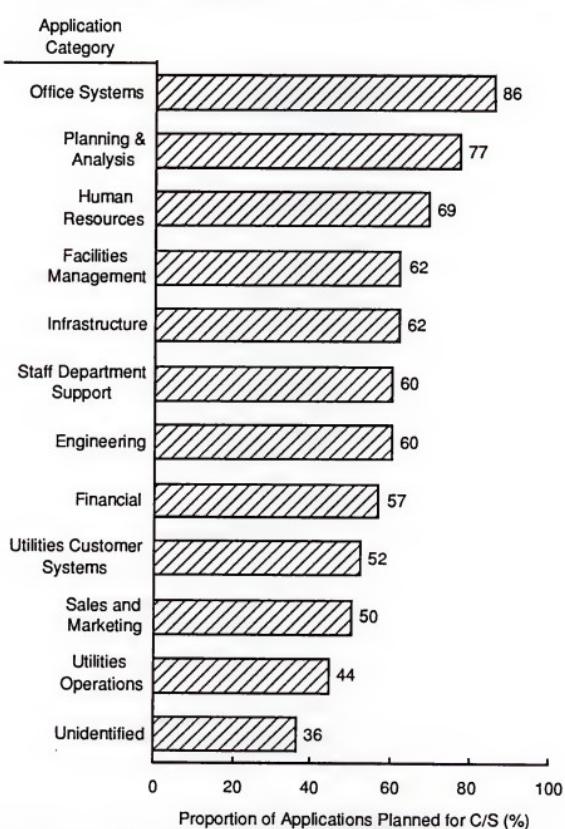
There are two primary reasons why utilities applications lag cross-industry applications in their migration to C/S:

- Many of the applications in the "utilities operations" category involve the real-time, on-line monitoring of power distribution and management. The nature of these applications implies central operational control and direct interaction with power grid monitoring devices, etc. They are more like process control applications than transaction processing systems. Consequently, the industry is just beginning to attempt to apply C/S technology in these areas.
- Given the huge investments in utilities operational systems, it requires significant investment to move them to C/S and this has to be undertaken in planned phases.

Some more insight into the best opportunities for C/S technology can be obtained by analyzing C/S penetration rates for each application group. Exhibit IV-4 ranks the application categories by their proportionate use of C/S technology.

Exhibit IV-4

Use of C/S by Applications Categories—Utilities



The *office systems* and *planning and analysis* categories contain applications that naturally lend themselves to C/S architecture. There is little doubt that more and more of those types of applications will continue to migrate to C/S in utilities as well as all other industry categories.

The heavy migration to C/S in applications within the *human resources* category is significant and is primarily being driven by the large number of human resource information systems scheduled for development over the next two to three years.

Twelve of the seventeen HR information systems identified in the sample will use C/S technology. The only hold out for mainframe architecture left in this category of applications is payroll. In fact, if the fourteen payroll applications in the human resources group are excluded, close to 75% of the remaining applications will move to C/S.

Utilities operations (44% C/S penetration) and utilities customer systems (52%) which represent the bulk of the industries operational systems fall below the 60% average C/S penetration for the entire sample. As pointed out earlier, the very nature of transmission and distribution management lends itself to a mainframe architecture. However, there has been recent successes in improving customer service by using workstations to access.

However, despite the fact that many of the industry's core applications will continue to require mainframe computing environments, the industries major infrastructure investments appear to be in support of C/S migration. The 62% C/S penetration for infrastructure investments is significantly higher than the 39% for insurance, or 35% for retail trade, and about equivalent to the 62% penetration for banking and finance. The only industries with significantly higher C/S penetration rates for infrastructure projects are in the manufacturing sectors.

B

Use of C/S in Specific Applications

Exhibit IV-5 shows the number of each type of application in the survey sample and the proportion of each targeted for use of C/S platforms. Applications are grouped by application category and ranked in descending order by number of applications per group.

Exhibit IV-5

**Detailed Distribution of Planned Applications
and Use of C/S Utilities**

Application Category	Application Type	No. Apps.	No. C/S	C/S(%)
Financial	Integrated Financial Systems	15	10	67
	Accounts Payable/Receivable	12	4	33
	General Ledger	7	4	57
	Financial Reporting	4	3	75
	Property Mgt. Systems	4	3	75
	Budgeting	3	2	67
	Fixed Assets	3	3	100
	Cost Accounting	2	1	50
	Financial Forecasting	2	1	50
	Financial Tracking	2	0	0
	Billing/Invoicing	1	0	0
	Cash Management	1	0	0
	Financial Modeling/Planning	1	1	100
	Management Accounting	1	1	100
Total		58	33	57
Human Resources	Human Resource Info. Systems	17	12	71
	Payroll	14	8	57
	Applicant Tracking	12	8	67
	Affirmative Action/EEO	3	3	100
	Benefits Administration	2	2	100
	New Employee Orientation	2	2	100
	Compensation/Job Evaluation	1	0	0
	HR - Other	1	1	100
Total		52	36	69
Facilities Management	Material Management Utilities	11	8	73
	Work Orders	10	4	40
	Facilities Management-Other	6	5	83
	Facilities Mapping	2	1	50
Total		29	18	62
Utilities Operations	Transmission/Distribution-Other	8	3	38
	Demand History/Usage Tracking	4	2	50
	Energy Management-Other	3	2	67
	Performance Monitoring	3	0	0
	Field Operations Support	3	2	67
	Field Maintenance	2	0	0
	Customer Delivery System	1	0	0
	SCADA Systems	1	1	100
	Service Outage Report/Restore	1	1	100
	Transmission Planning	1	1	100
Total		27	12	44

Exhibit IV-5 (Continued)

Application Category	Application Type	No. Apps.	No. C/S	C/S(%)
Infrastructure	Data Base Upgrade - General	4	3	75
	Data Base Upgrade - Rel/Dis	4	1	25
	Platform Migration - C/S, Dist	4	3	75
	LAN Upgrade	3	2	67
	Operating System Upgrades/Conversion	3	2	67
	Software Development Tools	2	0	0
	Wireless Wide Area Network	2	2	100
	Hardware Upgrades	1	1	100
	Imaging Systems	1	1	100
	Laptop or Portable Upgrade	1	1	100
Total	Software Upgrades (General)	1	0	0
		26	16	62
Utilities Customer Systems	Customer Support/Service/Help	18	9	50
	Utilities Customer Billing	4	3	75
	Customer Service Scheduling	1	0	0
Total		23	12	52
Engineering	CAD/CAM/CAE	8	5	63
	Requirements	2	1	50
	Engineering-Other	3	1	33
	Environmental Management	2	2	100
	Geographic Information Systems	1	0	0
	Nuclear Systems Planning	1	1	100
	Production/Capacity Force/Plan	2	1	50
	Geology/Seismic Info Systems	1	1	100
Total		20	12	60
Planning & Analysis	Spreadsheets/Databases	8	7	88
	Forecasting	2	1	50
	Executive Information Systems	1	1	100
	Project Management	1	0	0
	Planning & Analysis - Other	1	1	100
Total		13	10	77
Unidentified	Unidentified	11	4	36
Total		11	4	36
Staff Department Support	Materials Management	3	2	67
	Training	2	0	0
	Business Integration	1	1	100
	Corporate Policies/Stds	1	1	100
	Purchasing	1	1	100
	Regulatory Systems	2	1	50
Total		10	6	60

Exhibit IV-5 (Continued)

Application Category	Application Type	No. Apps.	No. C/S	C/S(%)
Office Systems	Desktop Publishing	2	1	50
	Integrated Office Systems	2	2	100
	Word Processing	2	2	100
	Office Systems - Other	1	1	100
Total		7	6	86
Sales and Marketing	Marketing Mgt./Support	3	2	67
	Sales Analysis & Reporting	2	1	50
	Sales & Marketing - Other	1	0	0
Total		6	3	50
GRAND TOTAL		282	168	60

There are a number of application categories where C/S has taken a foothold, and others that are likely prospects for future migration. Some examination of the specific applications within each group provides insight into likely future trends.

1. Financial Systems

The utilities industry has a number of unique accounting practices brought on by regulation and tradition. To a large degree the requirements for regulatory reporting reflect the industry's monopolistic period. As deregulation has evolved, most utilities find themselves in a situation where many of their accounting practices do not accurately reflect the realities of running a business in a more competitive environment. Consequently, there appears to be a major effort to rework the financial systems portfolio. In fact, as shown in the exhibit, the financial systems category has the largest number of planned implementations of any category in the sample.

The data indicates the driving force for change in the utilities financial suite will be the implementation of integrated financial systems. These will use C/S architecture in two out of three cases. C/S will provide a better opportunity for making the analytical information available to permit the kinds of financial analysis, forecasting and cost accounting required to view the business in a competitive environment. Of the total suite of financial applications, it appears that only the high-volume transaction processing systems such as accounts payable and receivable will remain on traditional centralized platforms.

2. Human Resources

This category, second largest in the sample, is also being driven by the need to obtain a more integrated set of data to support better decision making. The lead application in the group will be the implementation of human resource information systems. A full 70% of these systems will move to C/S technology.

As is the case in the financial suite, it appears that only the high-volume transaction processing systems, for example, payroll, will remain on traditional mainframe environments.

3. Facilities Management

This is the third largest group in the sample and shows an overall penetration of C/S over the next two years of more than 60%. The collection of applications in the suite is focused on all management aspects of distribution facilities—e.g., poles, pipes, transformers, transmission towers, etc. The information describing these assets is critical and used by a variety of other operational and financial systems. There is a strong geographic element to the information, as most of these assets have a fixed geographic location. Difficulty in maintaining the accuracy of the information on facilities has been a traditional problem due to the following:

- The requirement to maintain maps of varying levels of accuracy to support other applications requiring the data
- The fact that in the past different departments have attempted to maintain the same information from different data sources

The result has sometimes been redundant and conflicting information.

C/S offers an opportunity to rectify this situation by distributed data acquisition and management of the core information on a regional or district basis. Department-wide or more centralized applications can then access the data on an "as needed" basis. This direction is reflected in the survey results which show a heavy migration to C/S for materials management and general facilities management applications. The one significant hold-out appears to be the "work order" application which has traditionally been run on a centralized basis.

4. Utilities Operations

These systems are the heart and soul of the utilities industry and ranked number four in terms of the number of implementations over the next two years. Notably, they also showed the lowest penetration of C/S architecture—44%.

The two core applications for this category are:

- Supervisory Control and Data Acquisition (SCADA) systems for both plant operations and Energy Management Systems (EMSs)
- Transmission and Distribution (T&D) systems

Both have a heritage in analog process control and have evolved for most utilities into large-scale mainframe applications. Since these systems monitor and control the utilities network in real time, their performance is central to the economical and reliable operation of the entire system. Furthermore, access to utilities networks by co-generators and other third parties has complicated the management process.

The survey only identified four SCADA/EMS systems planned for implementation over the next two years. For that small group the C/S penetration rate is 75%. However, secondary research supports the notion that there is likely to be a large migration to C/S for these applications.

- All major suppliers in this turnkey market are pursuing the benefits of distributed workstation-based architectures; and claim that the cost is (or will be) half the price of traditional mainframe approaches.
- The advent of open systems facilitates the development of C/S-based applications which require the kind of real-time data acquisition and instrument monitoring required for these applications.

The prospects for C/S transmission and distribution (D&T) systems are not nearly as good. At least for the moment, only 38% of the planned D&T applications are adopting a C/S architecture.

5. Customer Systems

Customer accounting is a huge undertaking in the utilities industry. These systems evolved over the years from batch accounting applications to on-line customer inquiry and related functions. Today, most utilities view this entire suite of related applications as Customer Information Systems (CISs), handling order processing, meter reading, billing, credit and collection, adjustments, cash and customer information.

Most of these systems came into existence during the 1970s, running on large mainframe environments and, as a result, are becoming extremely difficult and expensive to maintain. Many rewrites appear to be remaining on the mainframe migrating to relational database environments and integrated applications suites to achieve an upgrade in functionality and reduced maintenance costs. However, a number of rewrites have attempted to move to some type of distributed technology for a solution. So far, the success rate has not been that good.

Nevertheless, survey data indicates that about 50% of these systems will be targeted for C/S environments over the next two years. Many, however, are likely to use a model which keeps the mainframe at the core of the activity as a giant server.

C

General Observations

From a historical perspective the utilities industry has traditionally had a nonintegrated systems function, divided into three distinct parts.

- Commercial or corporate business applications
- Engineering systems for the design and construction of facilities
- Operational systems emerging from primitive process control to full blown on-line real-time management systems.

The demands of deregulation resulting in increased competition are, in effect, forcing the industry to take a hard look at where and when it is appropriate to integrate these traditionally disparate activities, and C/S is playing a role. As shown in Exhibit IV-6, 13 of the myriad of applications identified in the survey will account for more than 50% of the applications development over the next two years, and 57% will migrate to C/S technology.

Exhibit IV-6

Leading Applications—Utilities

Application	Number Apps	% C/S	Cum. % Of Sample
Utilities Customer Systems	18	50	6
Human Resource Information Systems	17	71	12
Integrated Financial Systems	15	67	18
Payroll	14	57	23
Accounts Payable/Receivable	12	33	27
Applicant Tracking	12	67	31
Utilities Materials Management	11	73	35
Other Applications Systems	11	36	39
Work Order Processing Systems	10	40	43
CAD/CAM/CAE	8	63	45
Spreadsheet and Modeling	8	88	48
Transmission and Distribution	8	38	51
General Ledger	7	57	54

The department of Defense has been trying to use the Internet to forward its information to citizens. Within the last two years, it has developed a new system, the DOD Web, to give a better service to the military. This system allows citizens to obtain information on the Internet from the Defense Department's website. It also provides a way for citizens to communicate with the military.

Reading Activity - 1

Topic	Description
1	Online Defense System
2	Internet Resources Information System
3	Intelligent Information System
4	Protocol
5	Network Application
6	Application Ticket
7	WWW
8	WWW Navigation System
9	Network Application System
10	DODIN ... DOD
11	Protocol Stack Model
12	Transmission Line Definition
13	Sharing of Legend

C dir 1A

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- Annual conference

DATABASES

- Software and Services Market Forecasts
- Software and Services Vendors
- U.S. Federal Government
 - Procurement Plans (FAR)
 - Forecasts
 - Awards (FAS)
- Commercial Application (LEADS)

CUSTOM PROJECTS

For Vendors—analyze:

- Market strategies and tactics
- Service opportunities
- Satisfaction levels
- Competitive positioning
- Acquisition targets

For Buyers—evaluate:

- Specific vendor capabilities
- Outsourcing options
- Systems plans
- Peer position

OTHER SERVICES

Acquisition/partnership searches

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